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Ball Rail Systems NRFG

The Drive & Control Company

Ball Rail Systems NRFG

Product Description, Ball Rail Systems NRFG

General notes

- Ball Rail System NRFG for use in the packaging industry and food industry areas.
- For further information, additional technical data and maintenance notes, see the main catalog Ball Rail Systems R310..2226.
- **Combinations of different accuracy classes**
  Combining ball guide rails and runner blocks of different accuracy classes results in different tolerances for dimensions H and A_3. See “Accuracy Classes and their Tolerances” in the main catalog Ball Rail Systems R310..2226.

Intended use

- The Ball Rail System NRFG is a linear guide capable of absorbing forces from all transverse directions and moments about all axes. The Ball Rail System NRFG is intended exclusively for guiding and positioning tasks when installed in a machine.
- The product is intended exclusively for professional use and not for private use.
- Use for the intended purpose also includes the requirement that users must have read and understood the related documentation completely, in particular the “Safety instructions”.
- Use of the product in any other way than as described under “Intended use” is considered to be misuse and is therefore not permitted.
- Bosch Rexroth AG will not accept any liability for injury or damage caused by misuse of the product. The risks associated with any misuse of the product shall be borne by the user alone.

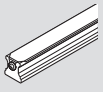
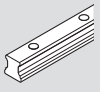
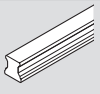
General safety instructions

- The safety rules and regulations of the country in which the product is used must be complied with.
- All applicable accident prevention and environmental regulations must be adhered to.
- The product may only be used when it is in technically perfect condition.
- The technical data and environmental conditions stated in the product documentation must be complied with.
- The product must not be put into service until it has been verified that the final product (for example a machine or system) into which the product has been installed complies with the country-specific requirements, safety regulations and standards for the application.
- Rexroth Ball Rail Systems may not be used in zones with potentially explosive atmospheres as defined in the ATEX directive 94/9/EC.
- Rexroth Ball Rail Systems must never be altered or modified. The user may only perform the work described in the “Quick User Guide” or the “Mounting Instructions for Ball Rail Systems”. The product must never be disassembled.

Product Overview, Ball Runner Blocks with Load Capacities and Moments

Ball runner blocks		Page	Size	15	20	25	30	35
				Load capacities (N) and load moments (Nm)				
Standard Ball Runner Blocks made of NRFG[2]	FNS R2001	18	C [1]	5 100	12 300	15 000	20 800	27 600
			C_0 [1]	9 300	16 900	21 000	28 700	37 500
			M_t [1]	63	205	270	460	760
	SNS R2011	24	M_{t0} [1]	90	215	295	500	805
			M_L [1]	34	110	150	245	375
			M_{L0} [1]	49	115	165	265	390
	FLS R2002	20	C [1]	8 500	16 000	20 000	26 300	36 500
			C_0 [1]	14 000	24 400	31 600	40 100	56 200
			M_t [1]	82	265	365	590	1 025
	SLS R2012	26	M_{t0} [1]	132	310	450	695	1 210
			M_L [1]	64	190	290	420	710
			M_{L0} [1]	104	230	350	495	840
	FKS R2000	22	C [1]	4 500	8 200	10 500	14 500	19 300
			C_0 [1]	5 600	9 400	12 600	17 200	22 400
			M_t [1]	44	125	195	320	545
	SKS R2010	28	M_{t0} [1]	55	115	180	295	485
			M_L [1]	16	45	70	110	170
			M_{L0} [1]	19	40	65	105	150

Product Overview, Ball Guide Rails with Rail Lengths

Ball guide rails		Page	Size				
			15	20	25	30	35
			Rail length (mm)				
Standard Ball Guide Rails Resist NR II[2]	 SNS R2045 .3. .. For mounting from above, with cover strip; secured with screws and washers	32	1 856	3 836	3 836	3 836	3 836
	 SNS R2045 .0. .. For mounting from above, with plastic mounting hole plugs	34	1 856	3 836	3 836	3 836	3 836
	 SNS R2047 .0. .. For mounting from below	36	1 856	3 836	3 836	3 836	3 836

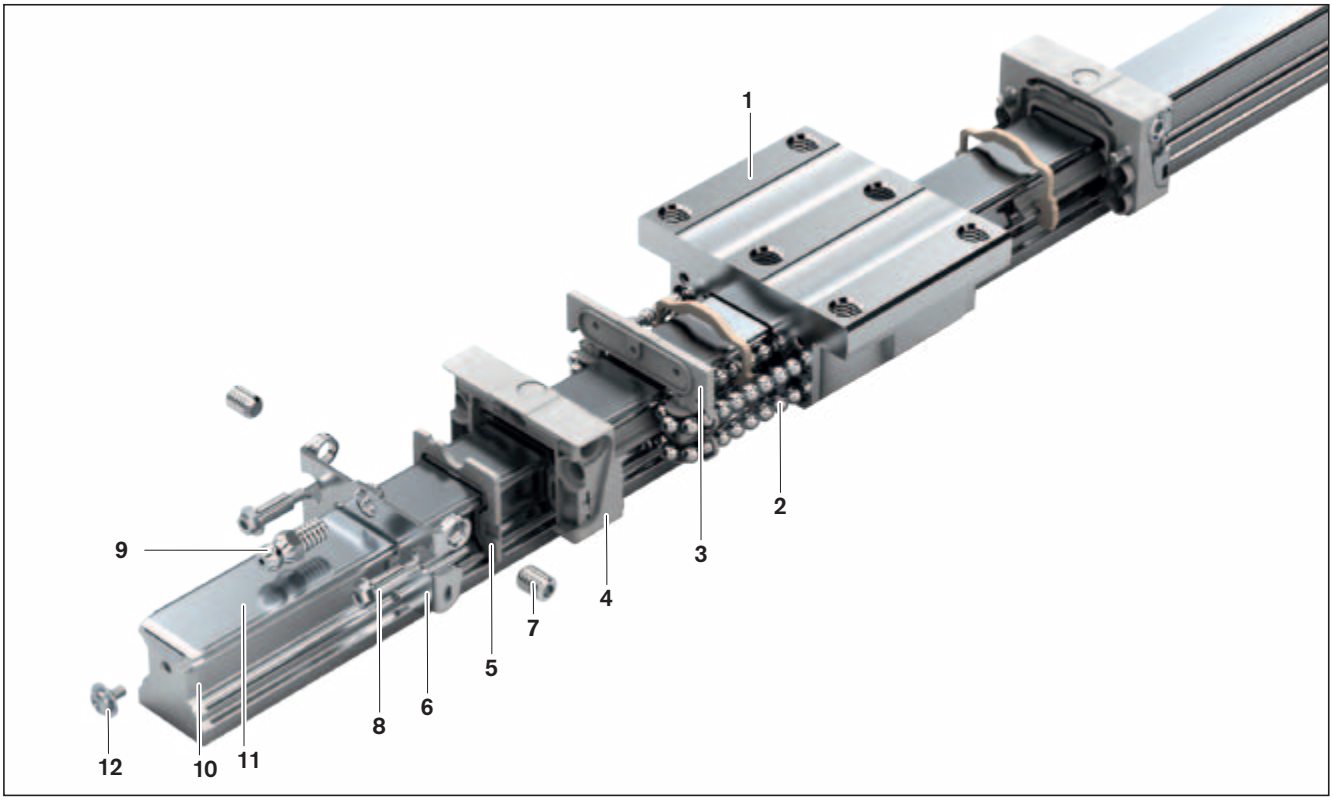
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1.
Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

1) Load capacities for Ball Runner Block without ball chain.

2) All steel parts made of corrosion-resistant steel as per EN 10088.

General Product Description

Material specifications



Item	Ball runner block	NRFG
1	Ball runner block body[1)]	Corrosion-resistant steel 1.4122
2	Balls[1)]	Corrosion-resistant steel 1.4112
3	Recirculation plate[2)]	Plastic TPE natural
4	Ball guide[2)]	Plastic POM natural
5	Sealing plate[2)]	Plastic TPE natural
6	Threaded plate[1)]	Corrosion-resistant steel 1.4306
7	Set screw[1)]	Corrosion-resistant steel 1.4301
8	Flanged screws[1)]	Corrosion-resistant steel 1.4303
9	Lube nipple[1)]	Corrosion-resistant steel 1.4305

Item	Ball guide rail	Resist NR II
10	Ball guide rail[3)]	Corrosion-resistant steel 1.4116
11	Cover strip[1)]	Corrosion-resistant steel 1.4310
12	Screw and washer[1)]	Corrosion-resistant steel 1.4301

1) Steel parts made of corrosion-resistant steel per DIN EN 10088 and AISI / NSF51
2) Plastic parts made of certified material as per Directive 2002/72/EG* and FDA21CFR
3) Steel parts made of corrosion-resistant steel per DIN EN 10088
* in preparation

When using Ball Rail Systems NRFG, the following points must be noted:

Influencing factors

Effects on Ball Rail Systems NRFG can vary considerably with temperature, the concentration of active substances, combinations of materials that can function as voltaic elements, and mechanical stresses.

Exposure

The effect on the material will differ depending on whether exposure is constant or sporadic. Periods of standstill can result in drying of process media, which could have an adverse effect on seals when restarting the system. Plastic parts are not resistant to UV radiation. Discoloration may occur. When exposed to UV rays for longer periods, the material has a tendency to become brittle.

Materials/media

Generally, a material can be well-suited or ill-suited to the environment, depending among other things on how the component is used. The plastic parts are resistant to weak acids, alkalis, organic solvents, oils and alcohols. They are not resistant to strong acids ($pH < 4$) and oxidizing media. The plastic parts have a standard flammability rating. When the ignition source is removed, the plastic will continue to burn, and melted material will drip down. Formaldehyde may be formed as a result of thermal degradation. At 15%, the oxygen index (that is, the concentration of oxygen that will support combustion) is very low compared to other types of plastics.

Directives and standards

Rexroth Ball Rail Systems NRFG are suitable for high-dynamic linear applications requiring reliability and precision. Other food and packaging industry demands include the use of approved materials in combination with hygienic design. These are governed by the most stringent standards, which must be fully complied with. The standards can vary significantly worldwide. It is therefore essential to understand the legislation and standards that apply in each particular region.

International standards

ISO 14159

This is a standard on hygiene requirements for the design of machinery. It covers several areas, of which food processing is one. It complies with the 3-A standards and is similar to European Standard EN 1672-2.

ISO 8086

A standard on the hygiene regulations for dairy plants. It provides a general guide to monitoring and sampling procedures.

EN ISO 12100

This standard is entitled Safety of machinery – General principles for design – Risk assessment and risk reduction. It gives a general overview and contains a guide to the major developments governing machines and their intended use.

EN ISO 21469

A standard dealing with Safety of machinery – Lubricants with incidental product contact – Hygiene requirements. It covers the formulation, manufacture, use and handling of lubricants which, during manufacture and processing, can come into incidental contact with products and packaging used in the food, and similar industries.

European Community - Directives and standards

Directive 2006/42/EC

The Machinery Directive describes the basic safety and health requirements for the design and manufacture of machinery. The manufacturer of a machine or his authorized representative has a duty to ensure that a risk assessment has been performed in order to determine the health and safety requirements which have to be fulfilled for that machine. The machine must be designed and built with the results of the risk assessment in mind.

Directive 2001/95/EC

This directive covers general safety requirements for any product placed on the market and intended for consumers, or likely to be used by consumers under reasonably foreseeable conditions, including products that are made available to consumers in the context of service provision for use by them.

Directive 85/374/EEC

This directive concerns liability for defective products and applies to industrially manufactured movables, irrespective of whether they have been incorporated into another movable or into an immovable or not.

Directive 76/769/EEC

This directive relates to restrictions on the marketing and use of certain dangerous substances and preparations. “Substances” means chemical elements and their compounds as they occur in the natural state or as produced by industry. "Preparations" means mixtures or solutions composed of two or more substances.

Directive 2002/72/EC

This directive relates to plastic materials and articles intended to come into contact with foodstuffs. These materials and articles and parts thereof may consist either exclusively of plastics, or multi-layer plastics, or be composed of different types of materials.

Directives and standards

German Ordinance 2125-40-46 on articles of daily use

This regulation specifies which materials are permitted for manufacturing articles of daily use and food packages and specifies limits for migration of contaminants to the human body or out of a packaging into a food.

EN 1672-2

Food processing machinery. Basic concepts. Part 2: Hygiene requirements. This standard contains measures for avoiding risk both to the operator (1672-1) and the consumer (1672-2). The standard applies to all machinery used in food production. As well as continuous production it covers batch processing, whether in open or closed processes.

DIN 10516

Food hygiene – Cleaning and disinfection. This standard provides guidance on selecting and implementing suitable measures for cleaning and disinfecting machinery and equipment used in the food processing industry.

DIN 11483

Dairy installations; cleaning and disinfection. Recommendations for the correct cleaning and disinfection of machinery and equipment in the dairy industry as well as information on suitable disinfecting and cleaning agents.

EN 415

Safety of packaging machines. This standard covers the safety requirements for the design, construction, installation, commissioning, operation, adjustment, maintenance, decommissioning and scrapping of various types of packaging machines and equipment.

Organizations

There are several organizations worldwide that can be contacted for detailed information:

FDA

The Food and Drug Administration has a mission to promote and protect public health in the United States by helping safe and effective products reach the market in a timely way and by monitoring products for continued safety after they are in use. Published by the FDA, the Code of Federal Regulations is an important reference for approved engineering materials.

Address:
U.S. Food and Drug Administration
10903 New Hamshire Ave.
Silver Spring, MD USA 20993
www.fda.gov

3-A

The Sanitary Standards Symbol Administrative Council, known in the industry as the 3-A, grants authorizations to use the 3-A symbol on dairy and food equipment that meets 3-A Sanitary Standards for design and fabrication.
Based in the USA, this organization has considerable experience in setting up voluntary standards for the food processing industry, particularly the dairy industry.

Address:
3-A Sanitary Standards, Inc.
6888 Elm Street, Suite 2D
McLean, Virginia USA 22101
www.3-a.org

EHEDG

The European Hygienic Engineering & Design Group is an independent group that works on establishing important guidelines and methods of testing for preserving safety in the food production process. The group consists of representatives of machine manufacturing companies and representatives of the relevant authorities.

Address:
EHEDG Secretariat
Avenue Grand Champ 148
1150 Brussels, Belgium
www.ehedg.org

Hazard analysis

The HACCP System (Hazard Analysis Critical Control Point System) is considered an effective and rational procedure for guaranteeing the safety of food products. The European standard 93/94 EEC stipulates that this risk analysis is to be used in food production.
The aim is not, however, to establish one specific HACCP plan for specific products. Instead, HACCP systems have to be set up by each individual manufacturer and adapted to the specific processing conditions.

Definitions

Control Point (CP)

This term signifies each point or each process in a specific food processing system that, if not controlled, will not lead to an unacceptable health hazard[1)].

Critical Control Point (CCP)

This term signifies each point or each process in a specific food processing system that, if not controlled, can lead to an unacceptable health hazard[1)].

Special hazards

HACCP should uncover special hazards (biological, chemical and physical).

Biological hazards

This first hazard class, which incorporates biological or microbiological hazards, can be sub-divided into three more classes: bacteria, viruses and parasites (protozoa and worms).

Chemical hazards

A chemical is a substance which is either used in a chemical process or results from such a process. All food products are made up of chemicals and all chemicals can, depending on the quantity, be toxic.

Physical hazards

Physical hazards are often described as external substances or foreign bodies. This includes any physical material that does not occur naturally in food and can lead to illnesses (including psychological trauma) or personal injuries (Corlett, 1991)[2)].

1) cf. UDSA in HACCP basics. See chapter references [4], page 28.
2) cf. Rhodehamel, E. Jeffrey. See chapter references [3], page 28.

Structure of the HACCP plan

As an example, an HACCP plan can consist of seven parts. Other alternatives are possible.

Analysis of hazards

All possible risks must be identified and classified according to type. It is also necessary to show how these risks can be avoided.

Determination of Critical Control Points

The critical control points (CCPs) for each production process have to be determined.

Establishment of limiting values

For each critical control point the limiting values or criteria have to be established.

Removing or monitoring CCPs

The first solution is to remove the CCP. If this is not possible, a monitoring system needs to be set up for monitoring the critical control points. (For example, who monitors which CCP, and how often?).

Stipulating corrective measures

Corrective measures need to be determined in case the limiting values/criteria are not observed.

Establishing routines

Routines have to be determined to ensure that the stipulated processes and measures are conformed with. (Monitoring of points: Establishing limiting values; Removing or monitoring CCP; Stipulating corrective measures).

Drawing up of documentation

Documentation must be drawn up on the HACCP system.

Product requirements for specific areas

Different demands apply to different processing areas. Components used in the food production process must be easy to maintain in order for precautions to be taken against microbiological contamination. This means the components must be easy to clean and must be protected against contamination. As a general rule, Ball Rail Systems NRFG may not come into contact with food.

Production areas

EN 1672-2 defines three different zones with different requirements.
These will determine the choice of Ball Rail Systems NRFG.

Food area

This area includes all surfaces that come or could come into contact with food and where there is a risk of food splash returning into the food process. The design must permit good and complete cleaning, with a surface finish which will prevent particles from remaining in small cavities. The surfaces should be self-draining and without poorly accessible crevices or dead spaces.

The use of Ball Rail Systems NRFG is not permitted because:
- For design-related reasons, crevices and dead spaces are present.
- Complete cleaning of the NRFG ball runner blocks is not possible.
- The surfaces of the Ball Rail Systems NRFG are not self-draining.
- There is a risk that food splashes could return into the food process.

Splash area

This includes surfaces where the food may splash or flow along, but where there is no risk of it remaining in the food process.

The use of Ball Rail Systems NRFG is permitted to a limited extent if:
- The adjoining structure has a guard or shield protecting the Ball Rail System NRFG from food splashes.
- No sticky or acidic liquids come into contact with the Ball Rail System NRFG.

Non-food area

The use of Ball Rail Systems NRFG is permitted in non-food areas when:
- The areas are not food zones or splash zones.
- The general requirements apply.
- Exposed surfaces are made of corrosion-resistant materials.
- The surfaces are easy to clean and wherever possible self-draining.

Working zones

Regardless of the type of production area, Rexroth suggests differentiating between dry and wet zones when selecting Ball Rail Systems NRFG.
The following definitions can be used:

Wet working zones

Areas in which liquid, moist or sticky food flows around machine parts, or areas which are wet-cleaned or disinfected. In such areas, Ball Rail Systems NRFG should have an adjoining structure with a guard or shield.

Dry working zones

Areas in which no wet media can come into contact with machine parts and where the relative humidity is equal to that of the normal area (up to 70%). The use of Ball Rail Systems NRFG is permitted.

Where special conditions of use are involved, please consult us.

⚠ **Ball Rail Systems NRFG have crevices and dead spaces. There is therefore a risk of food residues collecting (e.g. working their way under the cover strip or into the dead spaces in the runner blocks, etc.). For this reason, direct contact of Ball Rail Systems NRFG in the food area is not permitted!**

⚠ **The adjoining structure must be designed so that if the Ball Rail Systems NRFG should fail or be destroyed, no components (e.g. balls, plastic parts, etc.) can come into contact with food.**

⚠ **All steel parts of Ball Rail Systems NRFG are made from corrosion-resistant material as per EN 10088. In exceptional cases of use, corrosion phenomena may, however, still occur.**

Cleaning

Whether dry or wet cleaning is used, the cleaning process is a basic requirement for hygiene in the food industry.
The choice of materials for machinery and equipment in the food processing and packaging industry also depends on the detergents and cleaning methods used. Good hygienic design enables cleaning to be done in a shorter time, at lower temperatures and with less aggressive detergents, thus saving time and expense. In order to select the right components for a specific application, they must be judged by their ability to withstand the cleaning process. Their degree of corrosion resistance will determine their hygienic suitability.

Detergents

Cleaning of food machinery and equipment must take place in accordance with the manufacturer's instructions. It is important that materials, detergents and cleaning methods are compatible with each other.

From its own experience, Rexroth can provide the following information regarding cleaning:

- If POM plastic (polyoxymethylene) is not properly dried after cleaning with acid, there is a risk of formaldehyde being formed. The characteristics of plastics differ from case to case and from grade to grade. The risk of absorption must therefore be considered.
- Phosphoric acid is commonly used in detergents, and low-grade steels such as AISI 420 can only withstand this for short periods.
- However, it must be remembered that detergents usually also contain inhibitors which protect the material.
- One of the biggest risks is galvanic corrosion. This occurs, for example, when stainless steel is placed in contact with aluminum in a wet environment. Aluminum cannot withstand either strongly alkaline or strongly acidic conditions. Its durability may be increased by anodizing or coating, but the improvement obtained will depend on the quality of the surface treatment.
- Hard chromium plating on low-grade stainless steel carries a risk of substrate corrosion, in which case the plating will peel off in flakes.
- In general, surface treatment is good as long as the coating remains intact, but can increase the rate of corrosion if damaged.

Classification of Ball Rail Systems NRFG

- Corrosion durability class 2
- Hygiene class 3

⚠ **Cleaning of Ball Rail Systems NRFG with high-pressure cleaning equipment or similar is not permitted.**

⚠ **When using detergents or disinfectants, their compatibility with the materials used by Rexroth must be checked with the manufacturer.**

⚠ **After using detergents, the surface of the Ball Rail Systems NRFG must be dried and all residues removed.**

⚠ **Frequent cleaning cycles will affect the lubricants and the relubrication intervals.**
Where special conditions of use are involved, please consult us.

Hygienic design

The following are essential factors to ensure appropriate hygienic design in terms of the risk areas defined, e.g. in the HACCP system.

Bearings

Bearings should be mounted outside any food area, unless unavoidable.
Bearings used in food areas must be lubricated with food-grade lubricants and mounted so as to permit free-flow cleaning and disinfection.

Crevices

These have a detrimental effect on cleaning due to surface defects such as scratches and cracks. Smooth surfaces appropriate to the operational and hygiene requirements are preferable in this respect.

Dead spaces

Spaces in which a product, ingredient, cleaning or disinfecting agents or soil can be retained or incompletely removed during cleaning must be avoided or designed so that they are drainable and easy to clean and disinfect where required.

Drainage

A self-draining design and construction of the surface finish so as to prevent liquid from being retained or, if this is not possible, where the residual liquid can be removed by other means.

Threaded fasteners

Fasteners such as screws, bolts, rivets etc. are a hygienic concern and shall be avoided if possible, or placed so that they are easy to clean and disinfect.

Internal angles and corners

To ensure optimum flow rates of cleaning and disinfecting agents as well as to avoid hazards, corners must be well radiused and small angles avoided.

Joints

A direct metal-to-metal joint should be avoided, or if the joint is permanent, it should be continuously welded and free of imperfections.
Dismountable joints must be truly hygienic.

Seals

Sealing off or filling in an area to prevent unwanted materials or substances from penetrating or permeating.

Standard Ball Runner Blocks NRFG

Product Description

Characteristic features

Ball Runner Blocks NRFG made of corrosion-resistant steel1) are used particularly in applications involving water-based media.
They are also suitable for environments with a relative humidity of over 70% and temperatures above 30°C.
Since they have built-in corrosion protection, ball runner blocks NRFG are also ideal for use in the packaging industry and in areas of the food industry.
Where special conditions of use are involved, please consult us.

Highlights

- All metal parts made of corrosion-resistant steel
- All plastic parts made of FDA-certified material
- Available in five common sizes
- Excellent dynamic characteristics:
  Travel speed: $v_{max} = 5$ m/s
  Acceleration: $a_{max} = 500$ m/s^2
- Same load capacities in all four main load directions
- Available in accuracy class H up to preload class C2 (preload = 8% C)
- Long-term lubrication, up to several years
- Minimum quantity lubrication system with integrated reservoir for oil lubrication
- Lube ports with metal threads on all sides

Further highlights

- Limitless interchangeability; all ball guide rail versions can be combined at will with all ball runner block versions within each accuracy class
- Optimum system rigidity through preloaded O-arrangement
- Attachments can be bolted to the ball runner blocks from above or below2)
- Improved rigidity under lift-off and side loading conditions when additional mounting screws are used in the two holes provided at the center of the runner block2)
- Mounting threads provided on end faces for fixing of all add-on elements
- High rigidity in all load directions – permits applications with just one runner block per rail
- Integrated all-round sealing
- Optimized entry-zone geometry and high number of balls per track minimizes variation in elastic deflection
- Smooth, light running thanks to optimized ball recirculation and ball guidance
- Ball Guide Rails Resist NR II are available with or without cover strip and for mounting from above or below

1) Ball runner block body, ball guide rail and all steel parts made from corrosion-resistant steel per EN 10088
2) depends on type

Overview of Standard Ball Runner Block models in NRFG

FNS

FLS

FKS

SNS

SLS

SKS

Definition Ball Runner Block design style		Code (example) F	N	S
Width	**F**langed	**F**		
	Slimline			
	Wide			
	Compact			
Length	**N**ormal		**N**	
	Long			
	Short			
Height	**S**tandard height			**S**
	High			
	Low			

Standard Ball Runner Blocks NRFG

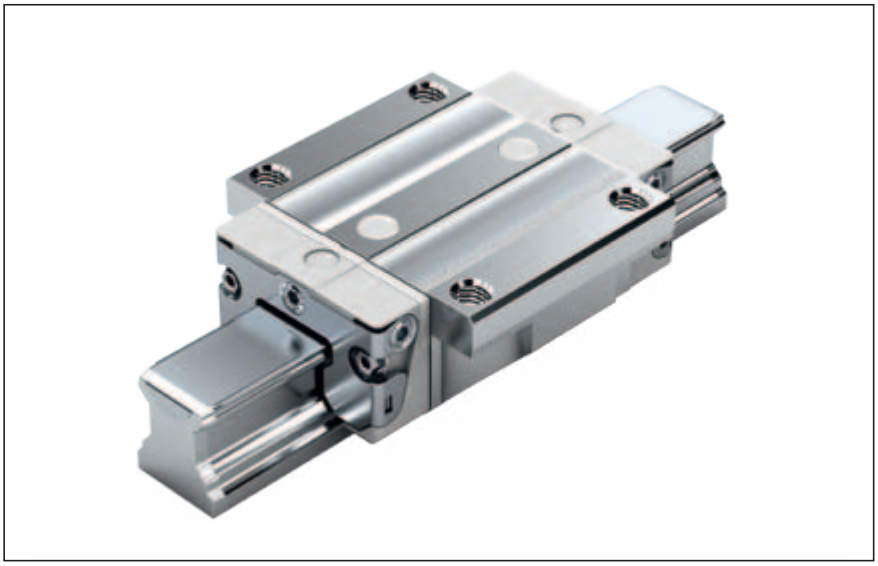
FNS – Flanged, normal, standard height

R2001 ... 14

Dynamic characteristics
Travel speed: $v_{max} = 5$ m/s
Acceleration: $a_{max} = 500$ m/s^2
(If $F_{comb} > 2.8 \cdot F_{pr}$: $a_{max} = 50$ m/s^2)

Note on lubrication
- Not pre-lubricated
- No preservative oil

Note
Can be used on all Ball Guide Rails SNS.



Options and part numbers

Size	Ball runner block with size	Preload class			Accuracy class	Seal for ball runner block without ball chain
		C0	C1	C2	H	SS
15	R2001 1	9	1	2	3	14
20	R2001 8	9	1	2	3	14
25	R2001 2	9	1	2	3	14
30	R2001 7	9	1	2	3	14
35	R2001 3	9	1	2	3	14
e.g.	R2001 7		1		3	14

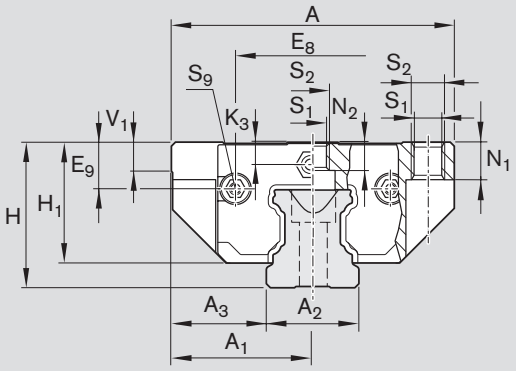
Ordering example
Options:
- Ball Runner Block NRFG, FNS
- Size 30
- Preload class C1
- Accuracy class H
- With standard seal, without ball chain

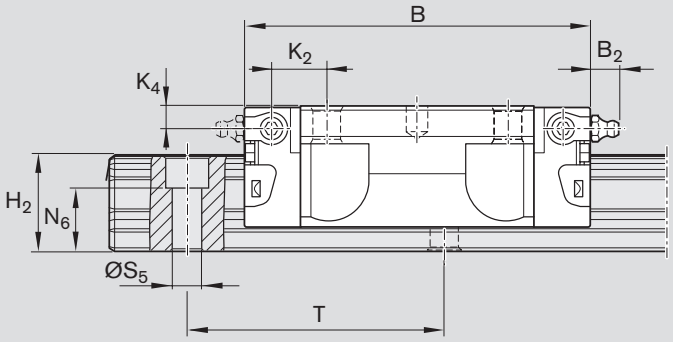
Part number: R2001 713 14

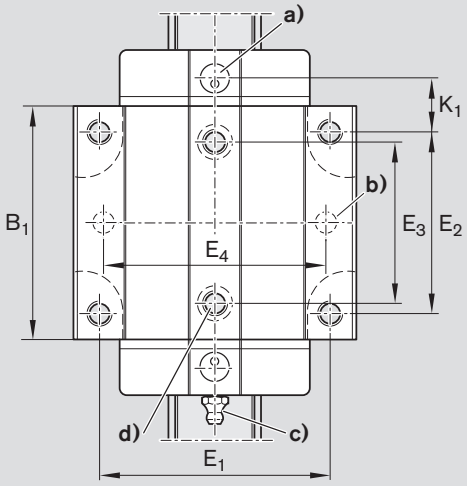
Preload classes
C0 = without preload
C1 = preload 2% C
C2 = preload 8% C

Seals
SS = standard seal

Ball Runner Blocks FNS







For O-ring
Size 15: Ø 4 · 1.0 (mm)
Size 20 - 35: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ R310..2202).

a) Recommended position for pin holes (dimensions E_4 ☞ R310..2202). Due to manufacturing reasons, there may be rough-drilled holes at the recommended positions. These may be bored open to accommodate the locating pins.

b) Lube nipple, size 15 - 20:
Funnel-type lube nipple DIN 3405-A M3x5, B_2 = 1.6 mm
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipple, size 25 - 35:
Hydraulic-type lube nipple DIN 71412-A M6x8, B_2 = 9.5 mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at all sides.

c) For manufacturing reasons, there may be plugs at these positions. These must be removed before mounting.

Size	Dimensions (mm)																		
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_3	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
15	47	23.5	15	16.0	58.2	39.2	38	30	26	24.55	6.70	24	19.90	16.30	16.20	8.00	9.6	3.20	3.20
20	63	31.5	20	21.5	75.0	49.6	53	40	35	32.50	7.30	30	25.35	20.75	20.55	11.80	11.8	3.35	3.35
25	70	35.0	23	23.5	86.2	57.8	57	45	40	38.30	11.50	36	29.90	24.45	24.25	12.45	13.6	5.50	5.50
30	90	45.0	28	31.0	97.7	67.4	72	52	44	48.40	14.60	42	35.35	28.55	28.35	14.00	15.7	6.05	6.05
35	100	50.0	34	33.0	110.5	77.0	82	62	52	58.00	17.35	48	40.40	32.15	31.85	14.50	16.0	6.90	6.90

Size	Dimensions (mm)									Weight (kg)	Load capacities 3 (N)		Load moments 3) (Nm)			
	N_1	N_2	$N_6^{\pm 0.5}$	S_1	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
15	5.2	4.40	10.3	4.3	M5	4.5	M2.5x3.5	60	5.0	0.20	5 100	9 300	63	90	34	49
20	7.7	5.20	13.2	5.3	M6	6.0	M3x5	60	6.0	0.45	12 300	16 900	205	215	110	115
25	9.3	7.00	15.2	6.7	M8	7.0	M3x5	60	7.5	0.65	15 000	21 000	270	295	150	165
30	11.0	7.90	17.0	8.5	M10	9.0	M3x5	80	7.0	1.10	20 800	28 700	460	500	245	265
35	12.0	10.15	20.5	8.5	M10	9.0	M3x5	80	8.0	1.60	27 600	37 500	760	805	375	390

1) Dimension H_2 with cover strip

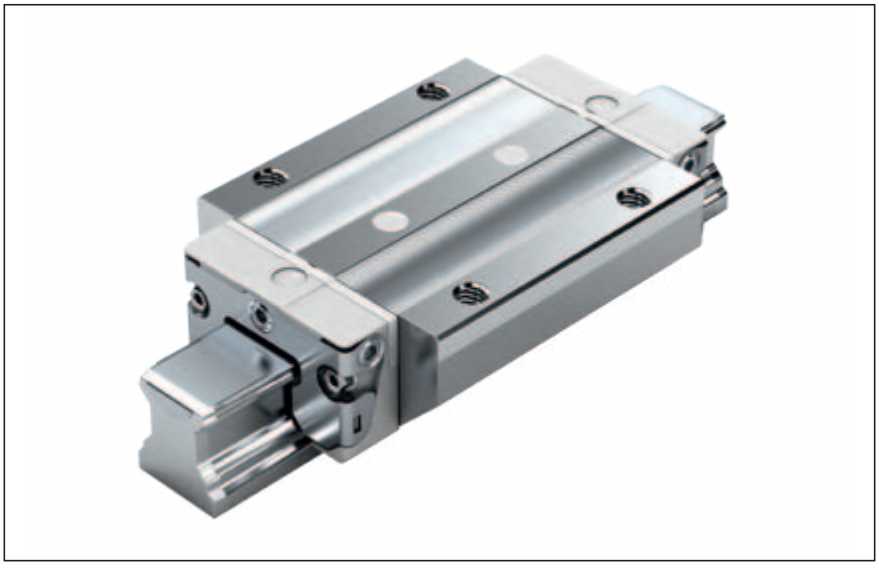
2) Dimension H_2 without cover strip

3) Load capacities and moments for Ball Runner Block **without** ball chain.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M}_t$ and $\mathbf{M}_L$ from the table by 1.26.

Standard Ball Runner Blocks NRFG

FLS – Flanged, long, standard height

R2002 ... 14



Dynamic characteristics
Travel speed: $v_{max} = 5$ m/s
Acceleration: $a_{max} = 500$ m/s^2
(If $F_{comb} > 2.8 \cdot F_{pr}$: $a_{max} = 50$ m/s^2)

Note on lubrication
– Not pre-lubricated
– No preservative oil

Note
Can be used on all Ball Guide Rails SNS.

Options and part numbers

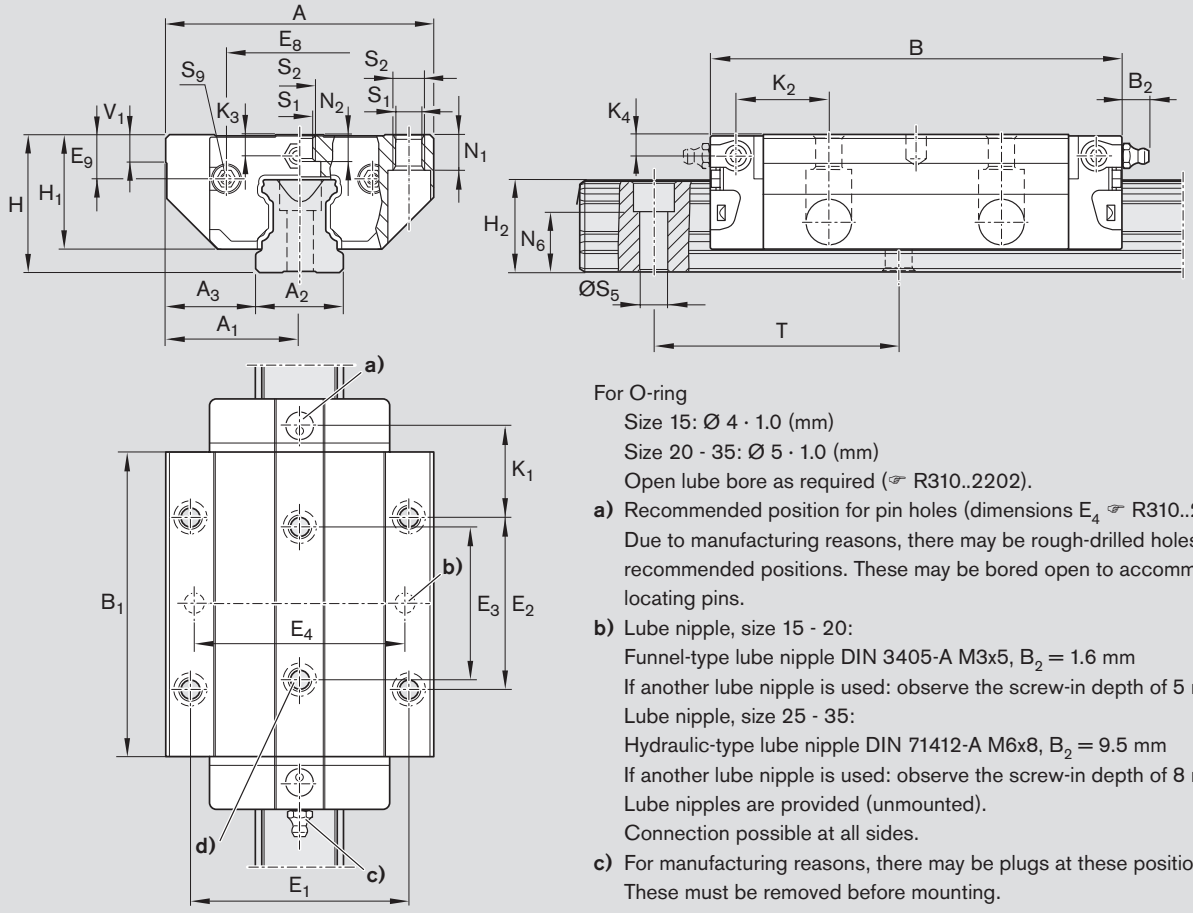
Size	Ball runner block with size	Preload class			Accuracy class	Seal for ball runner block without ball chain
		C0	C1	C2	H	SS
15	R2002 1	9	1	2	3	14
20	R2002 8	9	1	2	3	14
25	R2002 2	9	1	2	3	14
30	R2002 7	9	1	2	3	14
35	R2002 3	9	1	2	3	14
e.g.	R2002 7		1		3	14

Ordering example
Options:
– Ball Runner Block NRFG, FLS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R2002 713 14

Preload classes
C0 = without preload
C1 = preload 2% C
C2 = preload 8% C

Seals
SS = standard seal

Ball Runner Blocks FLS



For O-ring
Size 15: Ø 4 · 1.0 (mm)
Size 20 - 35: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ R310..2202).

a) Recommended position for pin holes (dimensions E_4 ☞ R310..2202). Due to manufacturing reasons, there may be rough-drilled holes at the recommended positions. These may be bored open to accommodate the locating pins.

b) Lube nipple, size 15 - 20:
Funnel-type lube nipple DIN 3405-A M3x5, $B_2 = 1.6$ mm
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipple, size 25 - 35:
Hydraulic-type lube nipple DIN 71412-A M6x8, $B_2 = 9.5$ mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at all sides.

c) For manufacturing reasons, there may be plugs at these positions. These must be removed before mounting.

Size	Dimensions (mm)																		
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_3	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
15	47	23.5	15	16.0	72.6	53.6	38	30	26	24.55	6.70	24	19.90	16.30	16.20	15.20	16.80	3.20	3.20
20	63	31.5	20	21.5	91.0	65.6	53	40	35	32.50	7.30	30	25.35	20.75	20.55	19.80	19.80	3.35	3.35
25	70	35.0	23	23.5	107.9	79.5	57	45	40	38.30	11.50	36	29.90	24.45	24.25	23.30	24.45	5.50	5.50
30	90	45.0	28	31.0	119.7	89.4	72	52	44	48.40	14.60	42	35.35	28.55	28.35	25.00	26.70	6.05	6.05
35	100	50.0	34	33.0	139.0	105.5	82	62	52	58.00	17.35	48	40.40	32.15	31.85	28.75	30.25	6.90	6.90

Size	Dimensions (mm)									Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	N_1	N_2	$N_6^{\pm 0.5}$	S_1	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
15	5.2	4.40	10.3	4.3	M5	4.5	M2.5x3.5	60	5.0	0.30	8 500	14 000	82	132	64	104
20	7.7	5.20	13.2	5.3	M6	6.0	M3x5	60	6.0	0.55	16 000	24 400	265	310	190	230
25	9.3	7.00	15.2	6.7	M8	7.0	M3x5	60	7.5	0.90	20 000	31 600	365	450	290	350
30	11.0	7.90	17.0	8.5	M10	9.0	M3x5	80	7.0	1.50	26 300	40 100	590	695	420	495
35	12.0	10.15	20.5	8.5	M10	9.0	M3x5	80	8.0	2.25	36 500	56 200	1 025	1 210	710	840

1) Dimension H_2 with cover strip

2) Dimension H_2 without cover strip

3) Load capacities and moments for Ball Runner Block **without** ball chain.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M}_t$ and $\mathbf{M}_L$ from the table by 1.26.

Standard Ball Runner Blocks NRFG

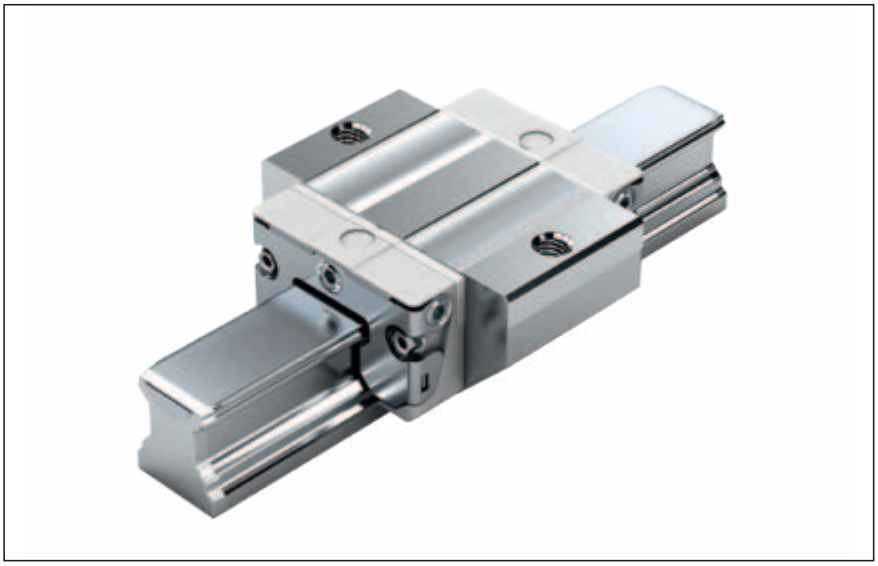
FKS – Flanged, short, standard height

R2000 ... 14

Dynamic characteristics
Travel speed: $v_{max} = 5$ m/s
Acceleration: $a_{max} = 500$ m/s^2
(If $F_{comb} > 2.8 \cdot F_{pr}$: $a_{max} = 50$ m/s^2)

Note on lubrication
– Not pre-lubricated
– No preservative oil

Note
Can be used on all Ball Guide Rails SNS.



Options and part numbers

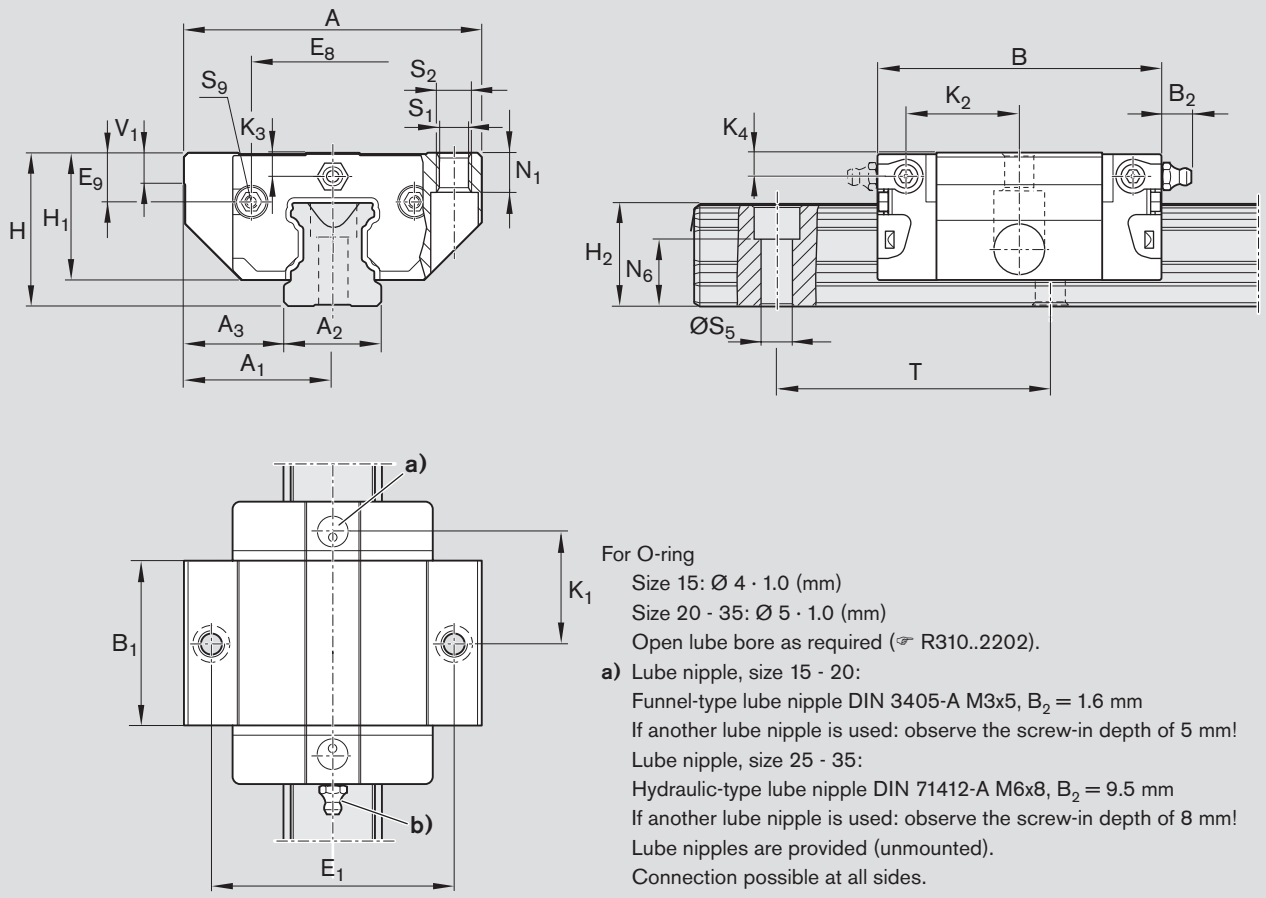
Size	Ball runner block with size	Preload class C0	Preload class C1	Accuracy class H	Seal for ball runner block without ball chain SS
15	R2000 1	9	1	3	14
20	R2000 8	9	1	3	14
25	R2000 2	9	1	3	14
30	R2000 7	9	1	3	14
35	R2000 3	9	1	3	14
e.g.	R2000 7		1	3	14

Ordering example
Options:
– Ball Runner Block NRFG, FKS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R2000 713 14

Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal

Ball Runner Blocks FKS



For O-ring
Size 15: Ø 4 · 1.0 (mm)
Size 20 - 35: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ R310..2202).

a) Lube nipple, size 15 - 20:
Funnel-type lube nipple DIN 3405-A M3x5, $B_2 = 1.6$ mm
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipple, size 25 - 35:
Hydraulic-type lube nipple DIN 71412-A M6x8, $B_2 = 9.5$ mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at all sides.

Size	Dimensions (mm)																
	A	A_1	A_2	A_3	B	B_1	E_1	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
15	47	23.5	15	16.0	44.7	25.7	38	24.55	6.70	24	19.90	16.30	16.20	16.25	17.85	3.20	3.20
20	63	31.5	20	21.5	57.3	31.9	53	32.50	7.30	30	25.35	20.75	20.55	22.95	22.95	3.35	3.35
25	70	35.0	23	23.5	67.0	38.6	57	38.30	11.50	36	29.90	24.45	24.25	25.35	26.50	5.50	5.50
30	90	45.0	28	31.0	75.3	45.0	72	48.40	14.60	42	35.35	28.55	28.35	28.80	30.50	6.05	6.05
35	100	50.0	34	33.0	84.9	51.4	82	58.00	17.35	48	40.40	32.15	31.85	32.70	34.20	6.90	6.90

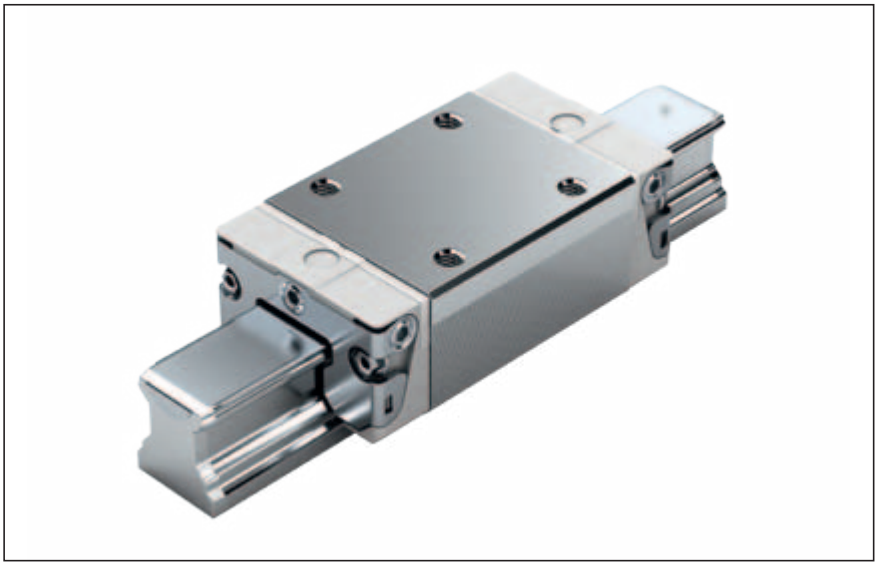
Size	Dimensions (mm)								Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	N_1	$N_6^{\pm 0.5}$	S_1	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
15	5.2	10.3	4.3	M5	4.5	M2.5x3.5	60	5.0	0.15	4 500	5 600	44	55	16	19
20	7.7	13.2	5.3	M6	6.0	M3x5	60	6.0	0.30	8 200	9 400	125	115	45	40
25	9.3	15.2	6.7	M8	7.0	M3x5	60	7.5	0.50	10 500	12 600	195	180	70	65
30	11.0	17.0	8.5	M10	9.0	M3x5	80	7.0	0.80	14 500	17 200	320	295	110	105
35	12.0	20.5	8.5	M10	9.0	M3x5	80	8.0	1.20	19 300	22 400	545	485	170	150

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip
3) Load capacities and moments for Ball Runner Block **without** ball chain.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

Standard Ball Runner Blocks NRFG

SNS – Slimline, normal, standard height

R2011 … 14



Dynamic characteristics
Travel speed: $v_{max} = 5$ m/s
Acceleration: $a_{max} = 500$ m/s^2
(If $F_{comb} > 2.8 \cdot F_{pr}$: $a_{max} = 50$ m/s^2)

Note on lubrication
– Not pre-lubricated
– No preservative oil

Note
Can be used on all Ball Guide Rails SNS.

Options and part numbers

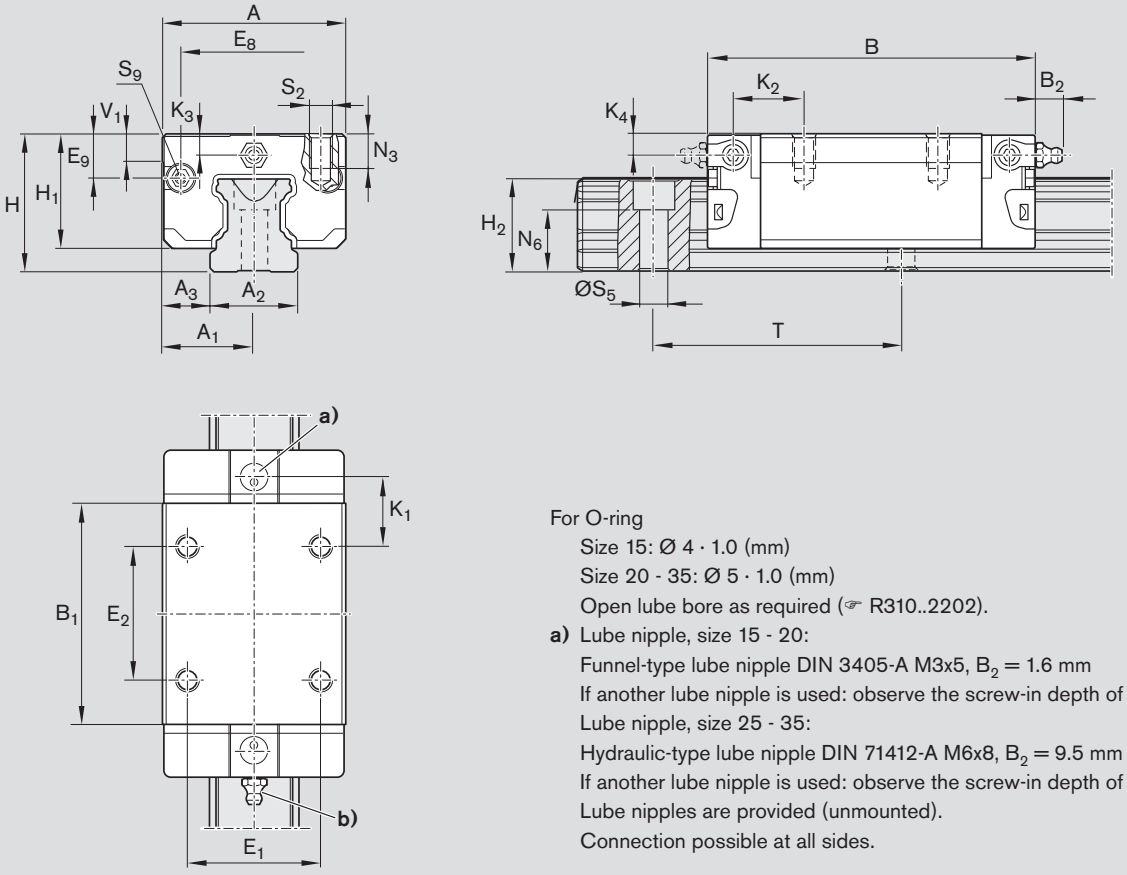
Size	Ball runner block with size	Preload class C0	C1	C2	Accuracy class H	Seal for ball runner block without ball chain SS
15	R2011 1	9	1	2	3	14
20	R2011 8	9	1	2	3	14
25	R2011 2	9	1	2	3	14
30	R2011 7	9	1	2	3	14
35	R2011 3	9	1	2	3	14
e.g.	R2011 7		1		3	14

Ordering example
Options:
– Ball Runner Block NRFG, SNS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R2011 713 14

Preload classes
C0 = without preload
C1 = preload 2% C
C2 = preload 8% C

Seals
SS = standard seal

Ball Runner Blocks SNS



For O-ring
Size 15: Ø 4 · 1.0 (mm)
Size 20 - 35: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ R310..2202).

a) Lube nipple, size 15 - 20:
Funnel-type lube nipple DIN 3405-A M3x5, B_2 = 1.6 mm
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipple, size 25 - 35:
Hydraulic-type lube nipple DIN 71412-A M6x8, B_2 = 9.5 mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at all sides.

Size	Dimensions (mm)																	
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
15	34	17	15	9.5	58.2	39.2	26	26	24.55	6.70	24	19.90	16.30	16.20	10.00	11.60	3.20	3.20
20	44	22	20	12.0	75.0	49.6	32	36	32.50	7.30	30	25.35	20.75	20.55	13.80	13.80	3.35	3.35
25	48	24	23	12.5	86.2	57.8	35	35	38.30	11.50	36	29.90	24.45	24.25	17.45	18.60	5.50	5.50
30	60	30	28	16.0	97.7	67.4	40	40	48.40	14.60	42	35.35	28.55	28.35	20.00	21.70	6.05	6.05
35	70	35	34	18.0	110.5	77.0	50	50	58.00	17.35	48	40.40	32.15	31.85	20.50	22.00	6.90	6.90

Size	Dimensions (mm)							Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	N_3	N_6 ±0.5	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
15	6.0	10.3	M4	4.5	M2.5x3.5	60	5.0	0.15	5 100	9 300	63	90	34	49
20	7.5	13.2	M5	6.0	M3x5	60	6.0	0.35	12 300	16 900	205	215	110	115
25	9.0	15.2	M6	7.0	M3x5	60	7.5	0.50	15 000	21 000	270	295	150	165
30	12.0	17.0	M8	9.0	M3x5	80	7.0	0.85	20 800	28 700	460	500	245	265
35	13.0	20.5	M8	9.0	M3x5	80	8.0	1.25	27 600	37 500	760	805	375	390

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip
3) Load capacities and moments for Ball Runner Block **without** ball chain.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

Standard Ball Runner Blocks NRFG

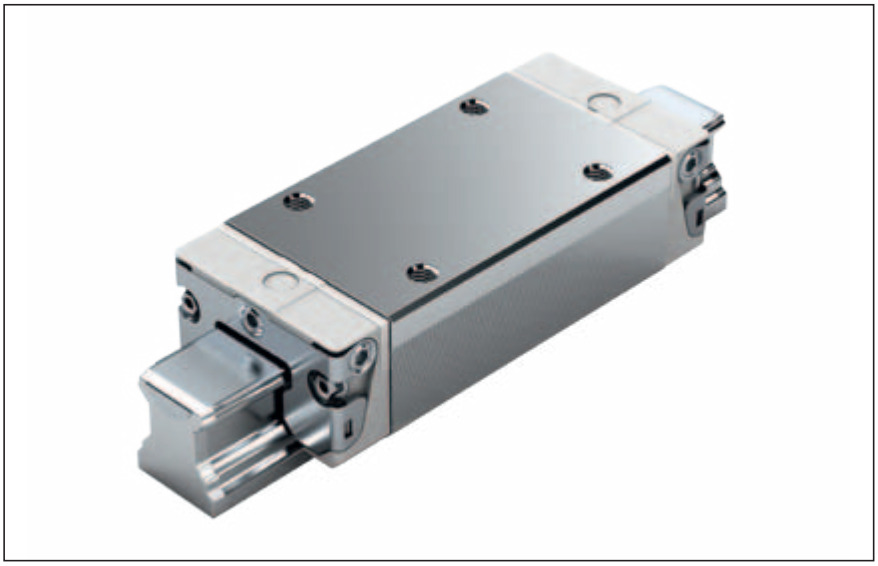
SLS – Slimline, long, standard height

R2012 ... 14

Dynamic characteristics
Travel speed: $v_{max} = 5$ m/s
Acceleration: $a_{max} = 500$ m/s^2
(If $F_{comb} > 2.8 \cdot F_{pr}$: $a_{max} = 50$ m/s^2)

Note on lubrication
– Not pre-lubricated
– No preservative oil

Note
Can be used on all Ball Guide Rails SNS.



Options and part numbers

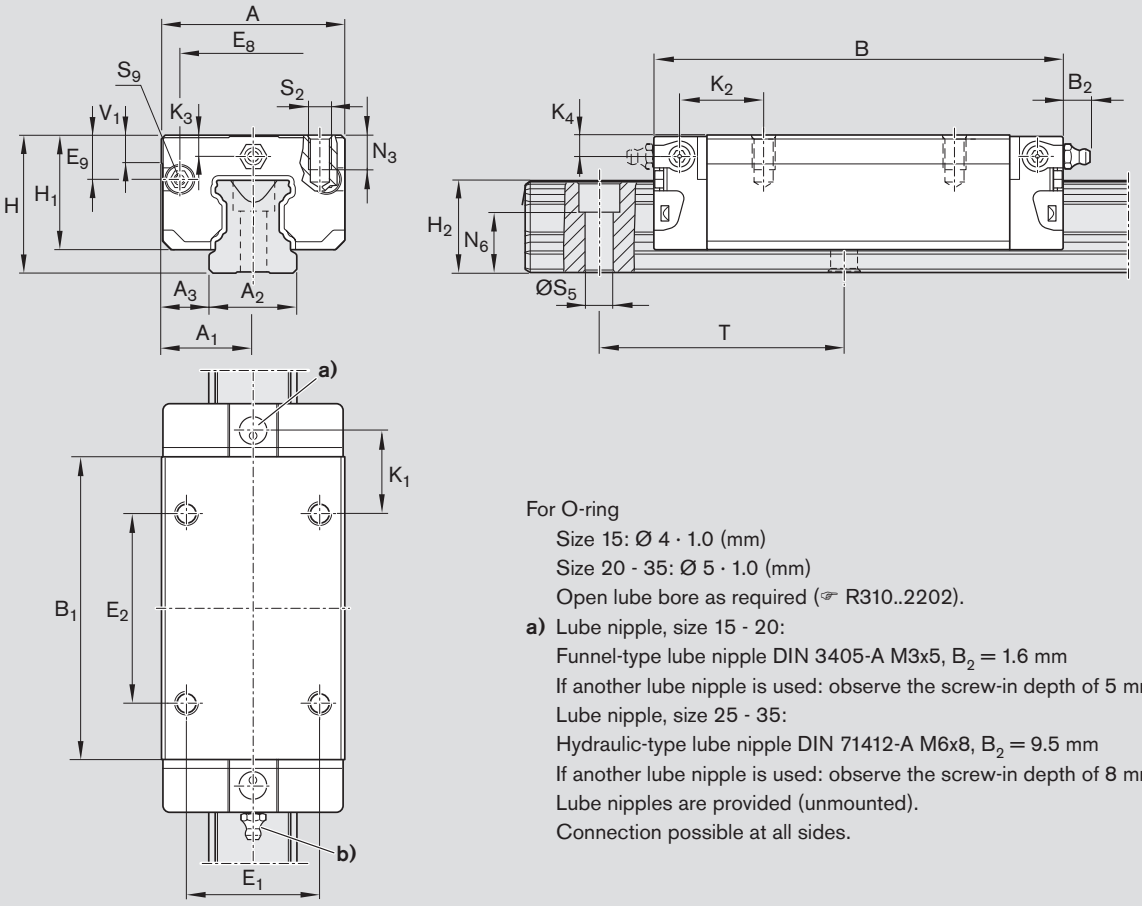
Size	Ball runner block with size	Preload class C0	C1	C2	Accuracy class H	Seal for ball runner block without ball chain SS
15	R2012 1	9	1	2	3	14
20	R2012 8	9	1	2	3	14
25	R2012 2	9	1	2	3	14
30	R2012 7	9	1	2	3	14
35	R2012 3	9	1	2	3	14
e.g.	R2012 7		1		3	14

Ordering example
Options:
– Ball Runner Block NR, SNS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R2012 713 14

Preload classes
C0 = without preload
C1 = preload 2% C
C2 = preload 8% C

Seals
SS = standard seal

Ball Runner Blocks SLS



For O-ring
Size 15: Ø 4 · 1.0 (mm)
Size 20 - 35: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ R310..2202).

a) Lube nipple, size 15 - 20:
Funnel-type lube nipple DIN 3405-A M3x5, B_2 = 1.6 mm
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipple, size 25 - 35:
Hydraulic-type lube nipple DIN 71412-A M6x8, B_2 = 9.5 mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at all sides.

Size	Dimensions (mm)																	
	A	A_1	A_2	A_3	B	B_1	E_1	E_2	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
15	34	17	15	9.5	72.6	53.6	26	26	24.55	6.70	24	19.90	16.30	16.20	17.20	18.80	3.20	3.20
20	44	22	20	12.0	91.0	65.6	32	50	32.50	7.30	30	25.35	20.75	20.55	14.80	14.80	3.35	3.35
25	48	24	23	12.5	107.9	79.5	35	50	38.30	11.50	36	29.90	24.45	24.25	20.80	21.95	5.50	5.50
30	60	30	28	16.0	119.7	89.4	40	60	48.40	14.60	42	35.35	28.55	28.35	21.00	22.70	6.05	6.05
35	70	35	34	18.0	139.0	105.5	50	72	58.00	17.35	48	40.40	32.15	31.85	23.75	25.25	6.90	6.90

Size	Dimensions (mm)							Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	N_3	$N_6^{\pm 0.5}$	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
15	6.0	10.3	M4	4.5	M2.5x3.5	60	5.0	0.20	8 500	14 000	82	132	64	104
20	7.5	13.2	M5	6.0	M3x5	60	6.0	0.45	16 000	24 400	265	310	190	230
25	9.0	15.2	M6	7.0	M3x5	60	7.5	0.65	20 000	31 600	365	450	290	350
30	12.0	17.0	M8	9.0	M3x5	80	7.0	1.10	26 300	40 100	590	695	420	495
35	13.0	20.5	M8	9.0	M3x5	80	8.0	1.70	36 500	56 200	1 025	1 210	710	840

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip
3) Load capacities and moments for Ball Runner Block **without** ball chain.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

Standard Ball Runner Blocks NRFG

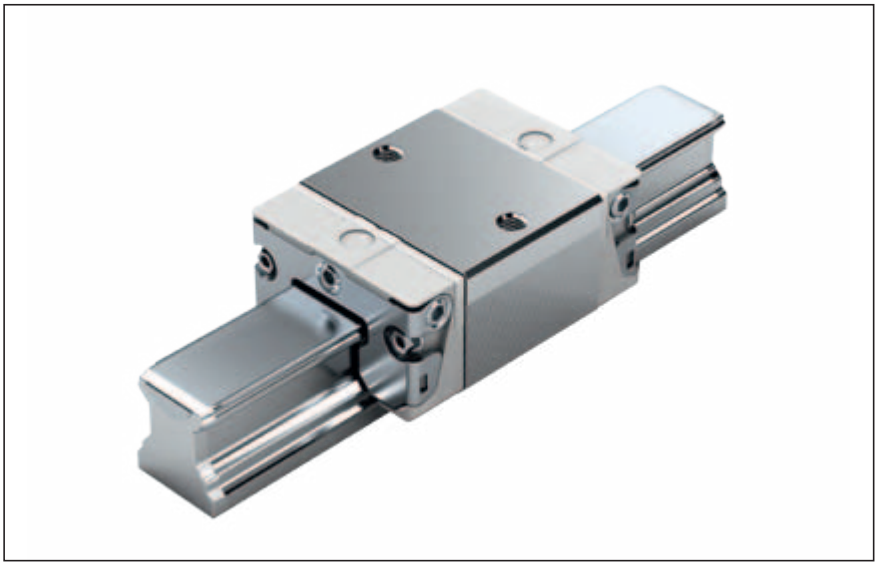
SKS – Slimline, short, standard height

R2010 ... 14

Dynamic characteristics
Travel speed: $v_{max} = 5$ m/s
Acceleration: $a_{max} = 500$ m/s^2
(If $F_{comb} > 2.8 \cdot F_{pr}$: $a_{max} = 50$ m/s^2)

Note on lubrication
– Not pre-lubricated
– No preservative oil

Note
Can be used on all Ball Guide Rails SNS.



Options and part numbers

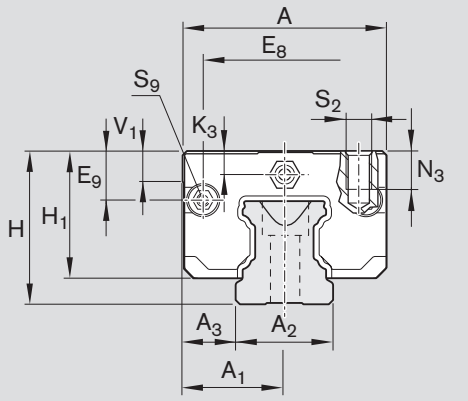
Size	Ball runner block with size	Preload class C0	Preload class C1	Accuracy class H	Seal for ball runner block without ball chain SS
15	R2010 1	9	1	3	14
20	R2010 8	9	1	3	14
25	R2010 2	9	1	3	14
30	R2010 7	9	1	3	14
35	R2010 3	9	1	3	14
e.g.	R2010 7		1	3	14

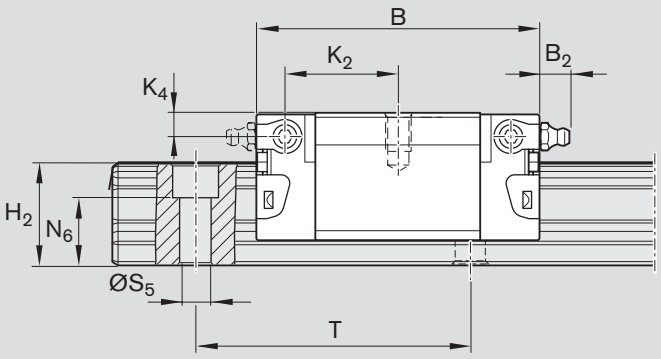
Ordering example
Options:
– Ball Runner Block SKS
– Size 30
– Preload class C1
– Accuracy class H
– With standard seal, without ball chain
Part number: R2010 713 14

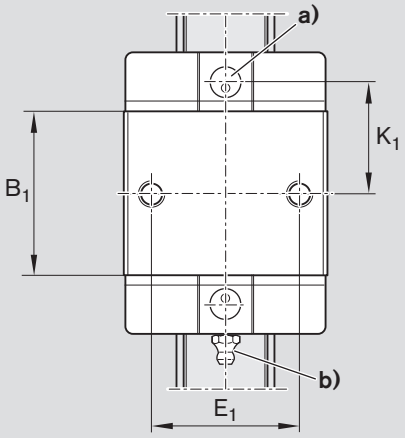
Preload classes
C0 = without preload
C1 = preload 2% C

Seals
SS = standard seal

Ball Runner Blocks SKS







For O-ring
Size 15: Ø 4 · 1.0 (mm)
Size 20 - 35: Ø 5 · 1.0 (mm)
Open lube bore as required (☞ R310..2202).

a) Lube nipple, size 15 - 20:
Funnel-type lube nipple DIN 3405-A M3x5, B_2 = 1.6 mm
If another lube nipple is used: observe the screw-in depth of 5 mm!
Lube nipple, size 25 - 35:
Hydraulic-type lube nipple DIN 71412-A M6x8, B_2 = 9.5 mm
If another lube nipple is used: observe the screw-in depth of 8 mm!
Lube nipples are provided (unmounted).
Connection possible at all sides.

Size	Dimensions (mm)																
	A	A_1	A_2	A_3	B	B_1	E_1	E_8	E_9	H	H_1	H_2 1)	H_2 2)	K_1	K_2	K_3	K_4
15	34	17	15	9.5	44.7	25.7	26	24.55	6.70	24	19.90	16.30	16.20	16.25	17.85	3.20	3.20
20	44	22	20	12.0	57.3	31.9	32	32.50	7.30	30	25.35	20.75	20.55	22.95	22.95	3.35	3.35
25	48	24	23	12.5	67.0	38.6	35	38.30	11.50	36	29.90	24.45	24.25	25.35	26.50	5.50	5.50
30	60	30	28	16.0	75.3	45.0	40	48.40	14.60	42	35.35	28.55	28.35	28.80	30.50	6.05	6.05
35	70	35	34	18.0	84.9	51.4	50	58.00	17.35	48	40.40	32.15	31.85	32.70	34.20	6.90	6.90

Size	Dimensions (mm)							Weight (kg)	Load capacities 3) (N)		Load moments 3) (Nm)			
	N_3	$N_6^{\pm 0.5}$	S_2	S_5	S_9	T	V_1		C	C_0	M_t	M_{t0}	M_L	M_{L0}
15	6.0	10.3	M4	4.5	M2.5x3.5	60	5.0	0.10	4 500	5 600	44	55	16	19
20	7.5	13.2	M5	6.0	M3x5	60	6.0	0.25	8 200	9 400	125	115	45	40
25	9.0	15.2	M6	7.0	M3x5	60	7.5	0.35	10 500	12 600	195	180	70	65
30	12.0	17.0	M8	9.0	M3x5	80	7.0	0.60	14 500	17 200	320	295	110	105
35	13.0	20.5	M8	9.0	M3x5	80	8.0	0.90	19 300	22 400	545	485	170	150

1) Dimension H_2 with cover strip
2) Dimension H_2 without cover strip
3) Load capacities and moments for Ball Runner Block **without** ball chain.
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m per ISO 14728-1. Often only 50,000 m are actually stipulated. For comparison: Multiply values **C**, $\mathbf{M_t}$ and $\mathbf{M_L}$ from the table by 1.26.

Product Description, Ball Guide Rails SNS

Characteristic features

– Top rigidity in all load directions
– High torque load capacity

Corrosion resistance and conditions of use
Ball guide rails Resist NR II made of corrosion-resistant steel as per EN 10088. Ball guide rails Resist NR II are used particularly in applications involving water-based media. They are also suitable for environments with a relative humidity of over 70% and temperatures above 30°C.
Since they have built-in corrosion protection, ball guide rails Resist NR II are also ideal for use in the semiconductor industry, machine tools, and especially wherever corrosion protection is required. Other application areas include the packaging industry and areas of the food industry.
Ball guide rails with corrosion-resistant coatings can also be replaced by ball guide rails Resist NR II.
Where special conditions of use are involved, please consult us.

Proven cover strip for ball guide rail mounting holes
– A single cover for all holes – saves time and money
– Made of corrosion-resistant spring steel per EN 10088
– Easy, secure mounting
– Clip on and fasten

Ball guide rails with cover strip
– Secured with screws and washers

Ball guide rails with white plastic mounting hole plugs

Ball guide rails for mounting from below

Definition Ball guide rail design style		Code (example)		
		S	N	S
Width	Slimline	S		
	Wide			
Length	Normal		N	
Height	Standard height			S

Ordering Examples

Ordering ball guide rails in recommended lengths

The procedure shown in the following ordering examples applies to all ball guide rails. Recommended rail lengths are more cost effective.

Options and part numbers

Size	Ball guide rail with size	Accuracy class N	H	P	Number of sections ., Rail length L (mm), ... One-piece	Composite	Hole spacing T (mm)	Recommended rail length according to formula $L = n_B \cdot T - 4$ mm Maximum number of holes n_B
15	R2045 14	4	3	2	31, ...	3., ...	60	30
20	R2045 84	4	3	2	31, ...	3., ...	60	64
25	R2045 24	4	3	2	31, ...	3., ...	60	64
30	R2045 74	4	3	2	31, ...	3., ...	80	48
35	R2045 34	4	3	2	61, ...	6., ...	80	48
e.g.	R2045 74		3		31, 1676			

Excerpt from table with part numbers and recommended rail lengths for ordering example

From the desired length to the recommended length

$$L = \left(\frac{L_W}{T}\right)^{*} \cdot T - 4$$

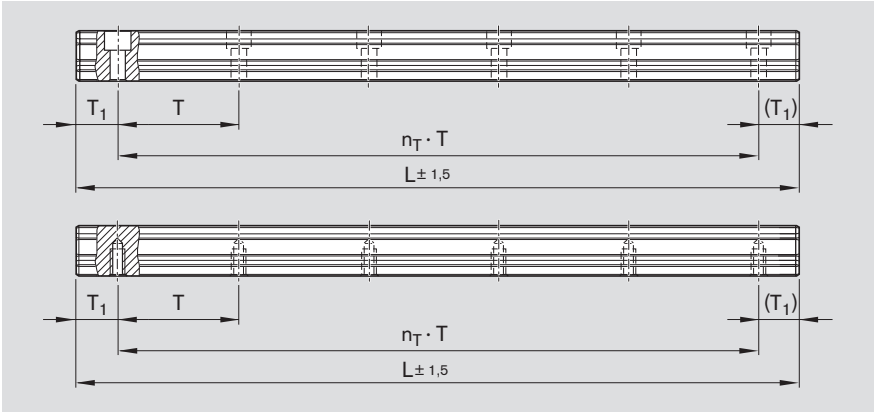
* Round up the quotient L_W/T to the next whole number.

W = desired length
T = hole spacing

Calculation example

$$L = \left(\frac{1660}{80\ \text{mm}}\right) \cdot 80\ \text{mm} - 4\ \text{mm}$$

$L = 21 \cdot 80\ \text{mm} - 4\ \text{mm}$
$L = 1676\ \text{mm}$



$$L = n_B \cdot T - 4\ \text{mm}$$

Basis: number of holes

$$L = n_T \cdot T + 2 \cdot T_{1S}$$

Basis: number of spaces between holes

L	=	recommended rail length	(mm)
L_W	=	desired rail length	(mm)
T	=	hole spacing[1)]	(mm)
T_{1S}	=	preferred dimension[1)]	(mm)
n_B	=	number of holes	(–)
n_T	=	no. of spaces between holes	(–)

1) For values, see dimensions table at dimension drawing.

Notes on ordering examples

If the preferred dimension T_{1S} cannot be used:
- Select an end space T_1 between T_{1S} and $T_{1\,min}$.
- Alternatively, select an end space between T_1 and T_{1max}.

Ordering example 1 (up to L_{max})

- Ball Guide Rail NR II, SNS size 30 with cover strip
- Accuracy class H
- Calculated rail length 1676 mm, ($20 \cdot T$, preferred dimension T_{1S} = 38 mm; number of holes $n_B = 21$)

Ordering data

Part number, rail length (mm)
T_1 / $n_T \cdot T$ / T_1 (mm)

R2045 743 31, 1676 mm
38 / 20 · 80 / 38 mm

Ordering example 2 (over L_{max})

- Ball Guide Rail NR II, SNS size 30 with cover strip
- Accuracy class H
- Calculated rail length 5116 mm, 2 sections ($63 \cdot T$, preferred dimension T_{1S} = 38 mm; number of holes $n_B = 64$)

Ordering data

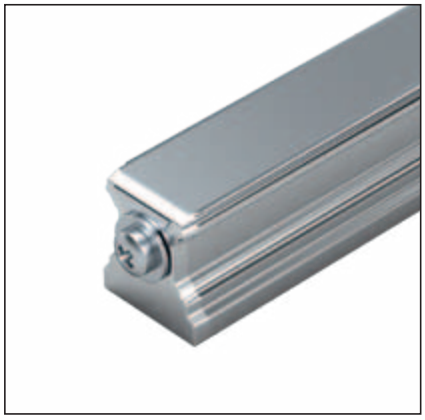
Part number and number of sections, rail length (mm)
T_1 / $n_T \cdot T$ / T_1 (mm)

R2045 743 32, 5116 mm
38 / 63 · 80 / 38 mm
For rail lengths greater than L_{max}, Rexroth provides matching rail sections for end to end mounting.

Ball Guide Rails, Resist NR II

SNS with Cover Strip, Screws and Washers

R2045 .4. ..



For mounting from above, with cover strip made of corrosion-resistant spring steel per EN 10088.
Cover strip secured with screws and washers.

Notes for mounting:
- Secure the cover strip!
- – Screws and washers are included in the supply scope.
- – Follow the mounting instructions! Send for the publications “Mounting Instructions for Ball Rail Systems” and “Mounting Instructions for the Cover Strip.”
- – Composite guide rails also available.

Options and part numbers

Size	Ball guide rail with size	Accuracy class			Number of sections ., Rail length L (mm), ...		Hole spacing T (mm)	Recommended rail length according to formula $L = n_B \cdot T - 4$ mm
		N	H	P	One-piece	Composite		Maximum number of holes n_B
15	R2045 14	4	3	2	31, ...	3., ...	60	30
20	R2045 84	4	3	2	31, ...	3., ...	60	64
25	R2045 24	4	3	2	31, ...	3., ...	60	64
30	R2045 74	4	3	2	31, ...	3., ...	80	48
35	R2045 34	4	3	2	61, ...	6., ...	80	48
e.g.	R2045 74		3		31, 1676			

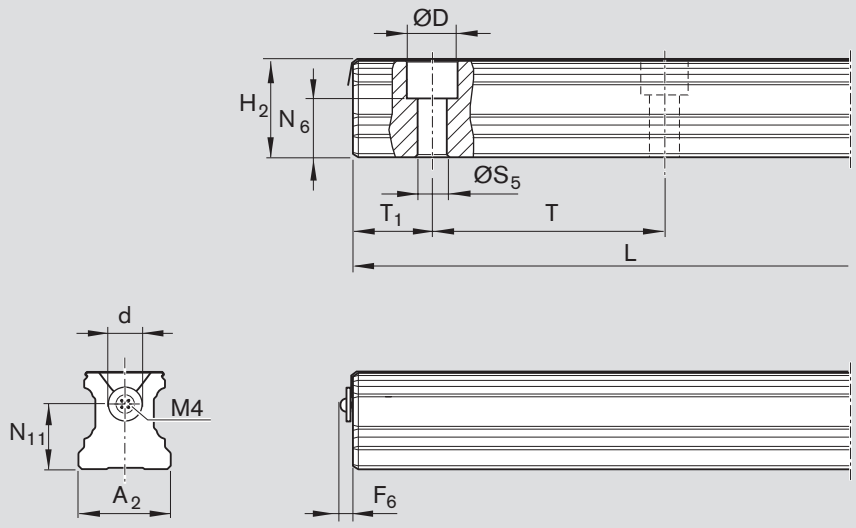
Ordering example 1:
(up to L_{max})
Options:
- – Ball Guide Rail NR II, SNS
- – Size 30
- – Accuracy class H
- – One-piece
- – Rail length L = 1676 mm

Part number:
R2045 743 31, 1676 mm

Ordering example 2:
(over L_{max})
Options:
- – Ball Guide Rail NR II, SNS
- – Size 30
- – Accuracy class H
- – **2 sections**
- – Rail length L = 5116 mm

Part number:
R2045 743 3**2**, 5116 mm

Ball Guide Rails SNS



Size	Dimensions (mm)													Weight
	A_2	D	F_4 [2]	F_5	F_6	H_2 [1]	L_{max}	$N_6^{\pm 0.5}$	S_5	T	$T_{1\ min}$ [3]	T_{1S} [4]	$T_{1\ max}$	(kg/m)
15	15	7.4	7.3	12	2.0	16.30	1 856	10.3	4.5	60	12	28.0	50	1.4
20	20	9.4	7.1	12	2.0	20.75	3 836	13.2	6.0	60	13	28.0	50	2.4
25	23	11.0	8.2	13	2.0	24.45	3 836	15.2	7.0	60	13	28.0	50	3.2
30	28	15.0	8.7	13	2.0	28.55	3 836	17.0	9.0	80	16	38.0	68	5.0
35	34	15.0	11.7	16	2.2	32.15	3 836	20.5	9.0	80	16	38.0	68	6.8

Accessories

– Cover strip (☞ R310..2202).
– Screws and washers

Size	Screw kit (screws and washers, 2 each per ball guide rail)	
	Part numbers	Weight (g)
15	R1619 139 40	4
20	R1619 839 40	5
25	R1619 239 40	6
30	R1619 339 40	7
35	R1619 339 40	7

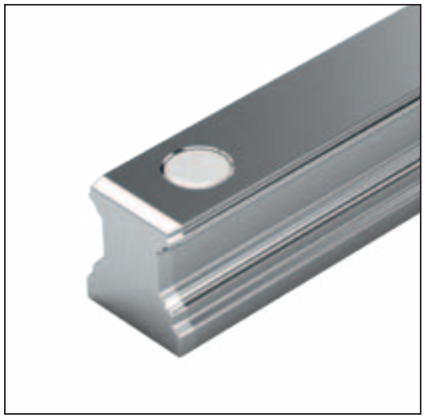
1) Dimension H_2 with cover strip
Size 15 with 0.1 mm cover strip
Size 20 - 30 with 0.2 mm cover strip
Size 35 with 0.3 mm cover strip
2) Recommended: preferred dimension T_{1S} with tolerances ± 0.75.

Ball Guide Rails, Resist NR II

SNS with Plastic Mounting Hole Plugs

R2045 .0. ..

For mounting from above,
with plastic mounting hole plugs



Notes for mounting:
- Plastic mounting hole plugs included in scope of supply.
- Follow the mounting instructions! Send for the publication “Mounting Instructions for Ball Rail Systems.”
- Composite guide rails also available.

Options and part numbers

Size	Ball guide rail with size	Accuracy class			Number of sections ., Rail length L (mm), ...		Hole spacing T (mm)	Recommended rail length according to formula $L = n_B \cdot T - 4$ mm
		N	H	P	One-piece	Composite		Maximum number of holes n_B
15	R2045 10	4	3	2	31, ...	3., ...	60	30
20	R2045 80	4	3	2	31, ...	3., ...	60	64
25	R2045 20	4	3	2	31, ...	3., ...	60	64
30	R2045 70	4	3	2	31, ...	3., ...	80	48
35	R2045 30	4	3	2	31, ...	3., ...	80	48
e.g.	R2045 70		3		31, 1676			

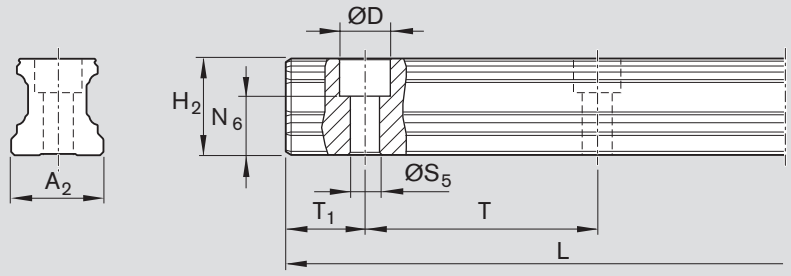
Ordering example 1:
(up to L_{max})
Options:
- Ball Guide Rail NR II, SNS
- Size 30
- Accuracy class H
- One-piece
- Rail length L = 1676 mm

Part number:
R2045 703 31, 1676 mm

Ordering example 2:
(over L_{max})
Options:
- Ball Guide Rail NR II, SNS
- Size 30
- Accuracy class H
- **2 sections**
- Rail length L = 5116 mm

Part number:
R2045 703 3**2**, 5116 mm

Ball Guide Rails SNS



Size	Dimensions (mm)										Weight
	A_2	D	H_2[1)]	L_{max}	$N_6^{\pm 0.5}$	S_5	T	$T_{1\ min}$	T_{1S}[2)]	$T_{1\ max}$	(kg/m)
15	15	7.4	16.20	1 856	10.3	4.5	60	10	28.0	50	1.4
20	20	9.4	20.55	3 836	13.2	6.0	60	10	28.0	50	2.4
25	23	11.0	24.25	3 836	15.2	7.0	60	10	28.0	50	3.2
30	28	15.0	28.35	3 836	17.0	9.0	80	12	38.0	68	5.0
35	34	15.0	31.85	3 836	20.5	9.0	80	12	38.0	68	6.8

Accessories

– Plastic Mounting Hole Plugs

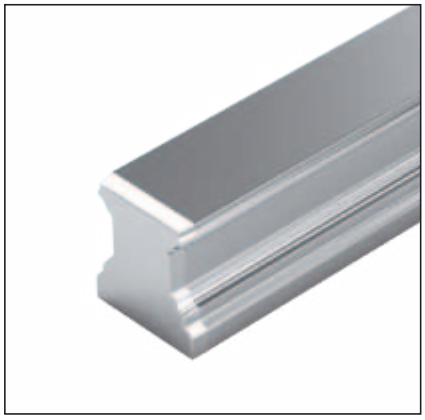
Size	Single cap	
	Part numbers[3)]	Weight (g)
15	R1605 100 84	0,05
20	R1605 800 84	0,10
25	R1605 200 84	0,30
30	R1605 300 84	0,60
35	R1605 300 84	0,60

1) Dimension H_2 without cover strip
2) Recommended: preferred dimension T_{1S} with tolerances ± 0.75.
3) Only this part number permitted when ordering replacements for mounting hole plugs

Ball Guide Rails, Resist NR II

SNS for mounting from below

R2047 .0. ..



Notes for mounting:
- Follow the mounting instructions!
- Send for the publication “Mounting Instructions for Ball Rail Systems.”
- Composite guide rails also available.

Options and part numbers

Size	Ball guide rail with size	Accuracy class			Number of sections ., Rail length L (mm), ...		Hole spacing T (mm)	Recommended rail length according to formula $L = n_B \cdot T - 4$ mm
		N	H	P	One-piece	Composite		Maximum number of holes n_B
15	R2047 10	4	3	2	31, ...	3., ...	60	30
20	R2047 80	4	3	2	31, ...	3., ...	60	64
25	R2047 20	4	3	2	31, ...	3., ...	60	64
30	R2047 70	4	3	2	31, ...	3., ...	80	48
35	R2047 30	4	3	2	31, ...	3., ...	80	48
e.g.	R2047 70		3		31, 1676			

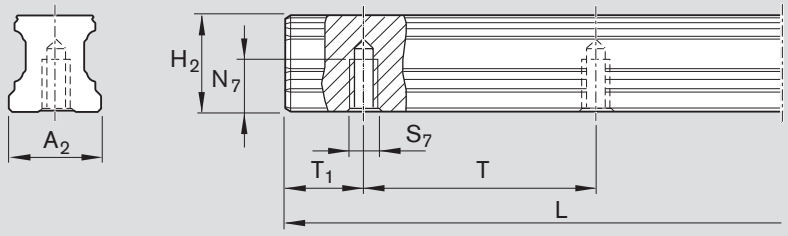
Ordering example 1:
(up to L_{max})
Options:
- Ball Guide Rail NR II, SNS
- Size 30
- Accuracy class H
- One-piece
- Rail length L = 1676 mm

Part number:
R2047 703 31, 1676 mm

Ordering example 2:
(over L_{max})
Options:
- Ball Guide Rail NR II, SNS
- Size 30
- Accuracy class H
- **2 sections**
- Rail length L = 5116 mm

Part number:
R2047 703 3**2**, 5116 mm

Ball Guide Rails SNS



Size	Dimensions (mm)									Weight
	A_2	H_2 1)	L_{max}	N_7	S_7	T	T_{1min}	T_{1S} 2)	$T_{1\ max}$	(kg/m)
15	15	16.20	1 856	7.5	M5	60	10	28.0	50	1.4
20	20	20.55	3 836	9.0	M6	60	10	28.0	50	2.4
25	23	24.25	3 836	12.0	M6	60	10	28.0	50	3.2
30	28	28.35	3 836	15.0	M8	80	12	38.0	68	5.0
35	34	31.85	3 836	15.0	M8	80	12	38.0	68	6.8

1) Dimension H_2 without cover strip

2) Recommended: preferred dimension T_{1S} with tolerances ± 0.75.

Notes on Lubrication

⚠ **H1 lubricants or release agents (preservatives) only have H1 approval in the neat, i.e. unmixed, condition (including the condition at the point of lubrication). A mixture of two H1 approved lubricants or preservatives does not have H1 approval.**

⚠ **If other lubricants than those specified are used, this may lead to a reduction in the relubrication intervals, the achievable travel in short-stroke applications, and the load capacities. Possible chemical inter-actions between the plastic materials, lubricants and preservative oils must also be taken into account.**

⚠ **Do not use greases containing solid particles (e.g., graphite or MoS_2)!**

⚠ **If the application conditions involve dirt, vibrations, impacts, etc., we recommend shortening the re-lubrication intervals accordingly. Even under normal operating conditions, the system must be relubricated at the latest after 2 years due to aging of the grease.**

⚠ **The seals for the ball runner blocks NRFG must be coated with the relevant lubricant before installation to ensure that they are not dry during start-up, which would cause them to wear out faster.**

⚠ **Ball runner blocks NRFG must never be put into operation without initial lubrication.**
The ball runner blocks are shipped without initial lubrication or preservative oil.

⚠ **Ball guide rails Resist NR II are coated with preservative oil before shipping.**
They must be cleaned before installation.

Where special conditions of use are involved, please consult us. For example, in the following cases:

- Other lubricants
- Frequent cleaning cycles
- Exposure to process media
- Extreme environmental conditions

Lubrication using a grease gun

Grease type

Rexroth recommends the following greases with NSF-H1 certification:
– VP 874 (from Chemie-Technik)
– Berulub FG H 2 SL (from Bechem)

The latest product information as well as product and material safety data sheets on these lubricants can be obtained from the relevant manufacturer.

Initial lubrication of the runner blocks (basic lubrication)

Stroke ≥ 2 · runner block length B_1 (normal stroke)

- Install and lubricate one lube fitting per runner block, at **either** of the two end caps!

Initial lubrication is applied in three partial quantities as specified in Table 1:

1. Grease the runner block with the first partial quantity as per Table 1, pressing it in slowly with the help of a grease gun.
2. Slide runner block back and forth over 3 · runner block length B_1 for three full cycles.
3. Repeat steps 1. and 2. two more times.
4. Make sure there is a visible film of grease on the guide rail.

Size	Initial lubrication (normal stroke) Part number R20.. ... 14 Partial quantity (cm^3)
15	0,4 (3x)
20	0,7 (3x)
25	1,4 (3x)
30	2,2 (3x)
35	2,2 (3x)

Table 1

⚠ **Refer to the Notes on Lubrication!** ☞ 40

Stroke < 2 · runner block length B_1 (short stroke)

- Install and lubricate two lube fittings per runner block, one on **each** of the two end caps!

Initial lubrication is applied to each fitting in three partial quantities as specified in Table 2:

1. Grease each fitting on the runner block with the first partial quantity as per Table 2, pressing it in slowly with the help of a grease gun.
2. Slide runner block back and forth over 3 · runner block length B_1 for three full cycles.
3. Repeat steps 1. and 2. two more times.
4. Make sure there is a visible film of grease on the guide rail.

Size	Initial lubrication (short stroke) Part number R20.. ... 14 Partial quantity per port (cm^3)	
	left	right
15	0,4 (3x)	0,4 (3x)
20	0,7 (3x)	0,7 (3x)
25	1,4 (3x)	1,4 (3x)
30	2,2 (3x)	2,2 (3x)
35	2,2 (3x)	2,2 (3x)

Table 2

⚠ **Refer to the Notes on Lubrication!** ☞ 40

Lubrication using a grease gun (continued)

Relubrication of runner blocks

Stroke ≥ 2 · runner block length B_1 (normal stroke)

- When the relubrication interval according to Graph 1 ☞ 43 has been reached, relubricate twice, adding the partial quantity according to Table 3 each time.

1. Grease the runner block with the first partial quantity as per Table 3, pressing it in slowly with the help of a grease gun.
2. Slide runner block back and forth over 3 · runner block length B_1 for three full cycles.
3. Repeat steps 1. and 2. two more times.
4. Make sure there is a visible film of grease on the guide rail.

⚠ **Refer to the Notes on Lubrication!** ☞ 40

Size	Relubrication (normal stroke) Part number R20.. ... 14 Partial quantity (cm^3)
15	0.4 (2x)
20	0.7 (2x)
25	1.4 (2x)
30	2.2 (2x)
35	2.2 (2x)

Table 3

Stroke < 2 · runner block length B_1 (short stroke)

- When the relubrication interval according to Graph 1 ☞ 43 has been reached, relubricate twice per port, adding the partial quantity according to Table 4 each time.

1. Grease each fitting on the runner block with the first partial quantity as per Table 4, pressing it in slowly with the help of a grease gun.
2. At each lubrication cycle the runner block should be traversed back and forth for three full cycles over a stroke of 3 • runner block length B_1; the minimum stroke requirement in all cases is three full cycles over runner block length B_1.
3. Repeat steps 1. and 2. two more times.
4. Make sure there is a visible film of grease on the guide rail.

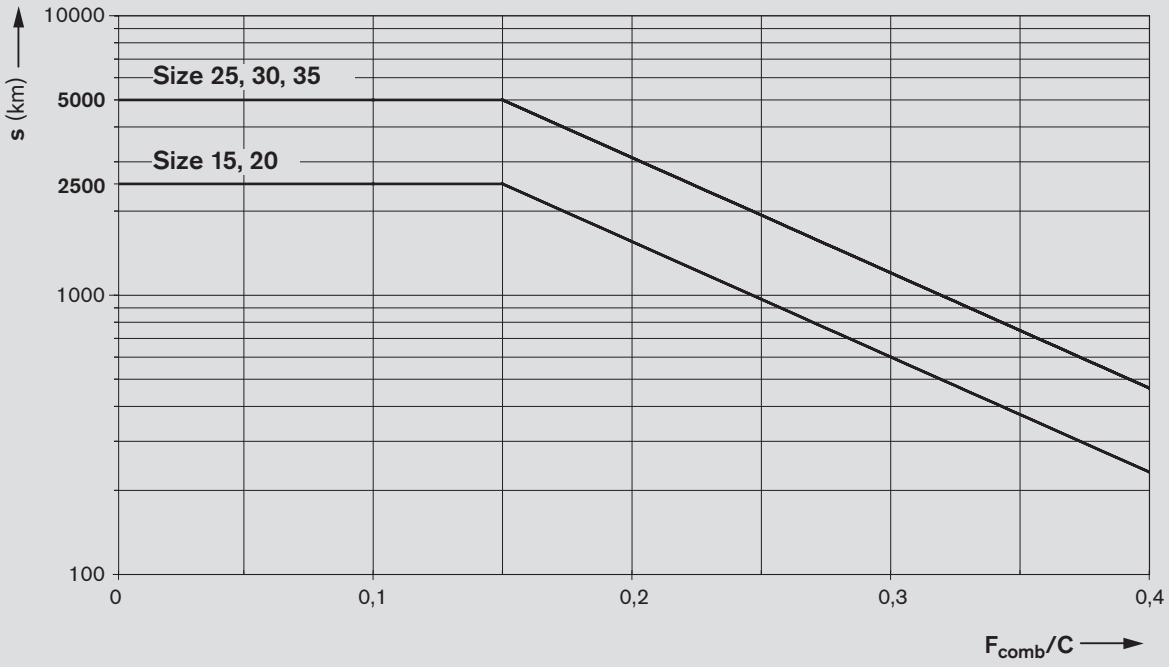
⚠ **Refer to the Notes on Lubrication!** ☞ 40

Size	Relubrication (short stroke) Part number R20.. ... 14 Partial quantity per port (cm^3)	
	left	**right**
15	0.4 (2x)	0.4 (2x)
20	0.7 (2x)	0.7 (2x)
25	1.4 (2x)	1.4 (2x)
30	2.2 (2x)	2.2 (2x)
35	2.2 (2x)	2.2 (2x)

Table 4

Load-dependent relubrication intervals for grease lubrication using grease guns

The following conditions apply:
- Ball runner blocks NRFG, part number: R20.. ... 14
- Grease lubricant VP 874 or Berulub FG H 2 SL
- No exposure to metalworking fluids
- Standard seals
- Ambient temperature: T = + 20 up to + 30 °C



Graph 1

Key to graphs

Key to graphs

C = dynamic load capacity (N)
F_{comb} = combined equivalent dynamic load on bearing (N)
F_{comb}/C = load ratio (–)
s = relubrication interval expressed as travel (km)

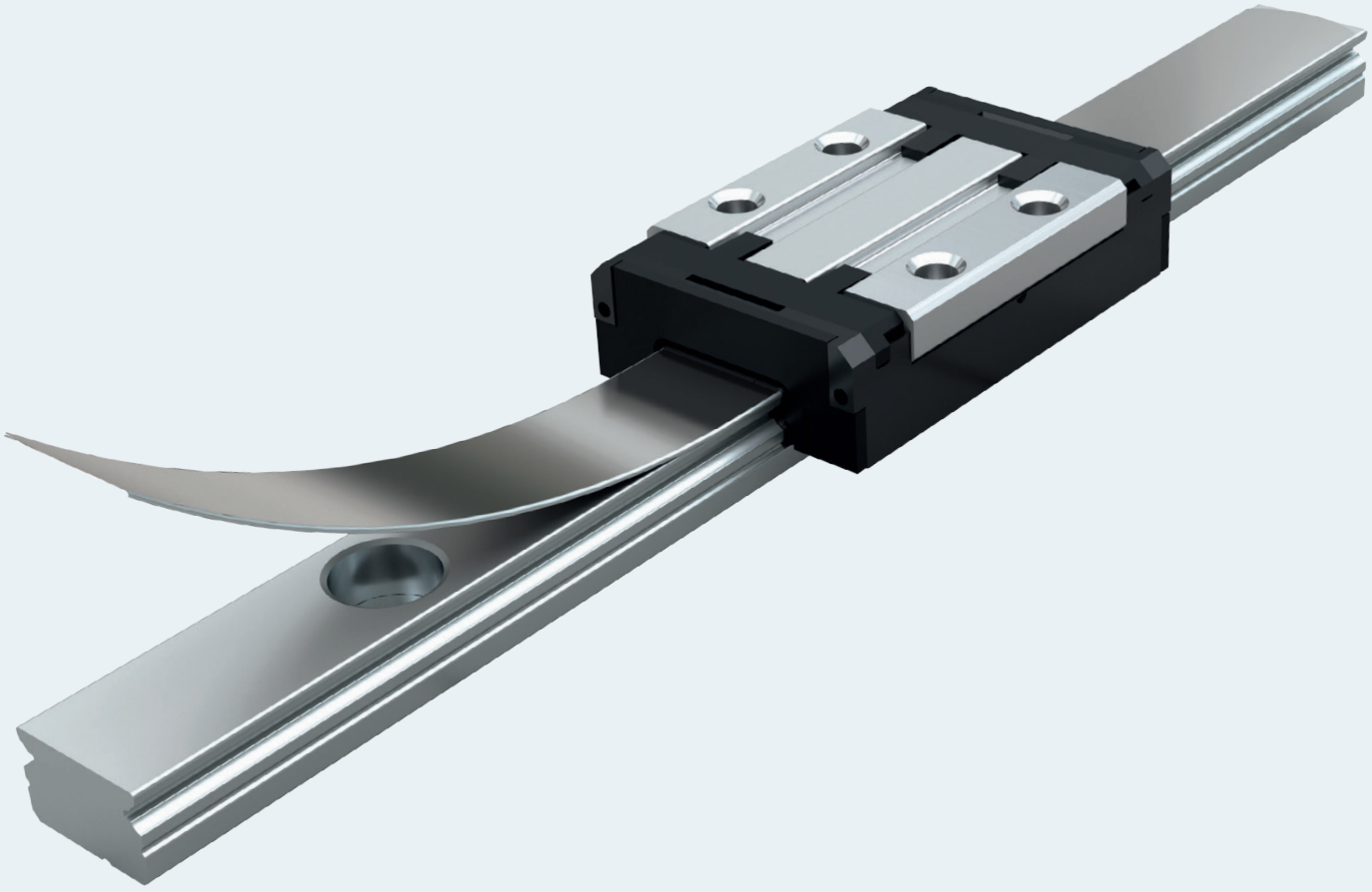
Definition of F_{comb}/C

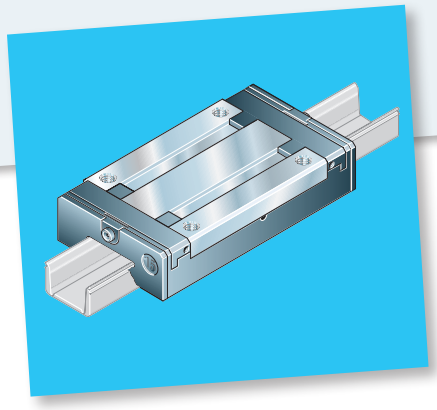
The load ratio F_{comb}/C is the quotient of the equivalent dynamic load on the bearing at the combined load on the bearing F_{comb} (taking account of the internal preload force F_{pr}) divided by the dynamic load capacity C ☞ 5.

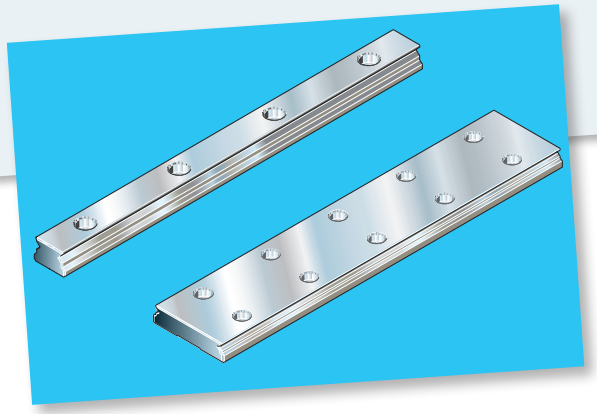
⚠ **Refer to the Notes on Lubrication!** ☞ 40

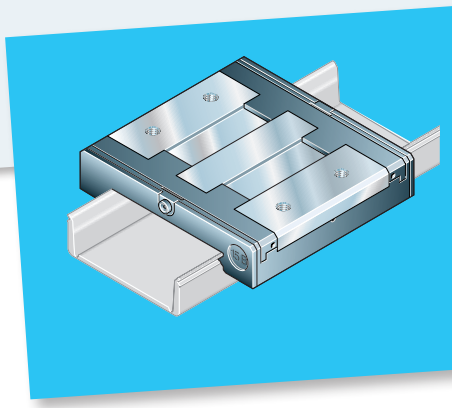
rexroth
A Bosch Company

Miniature ball rail systems









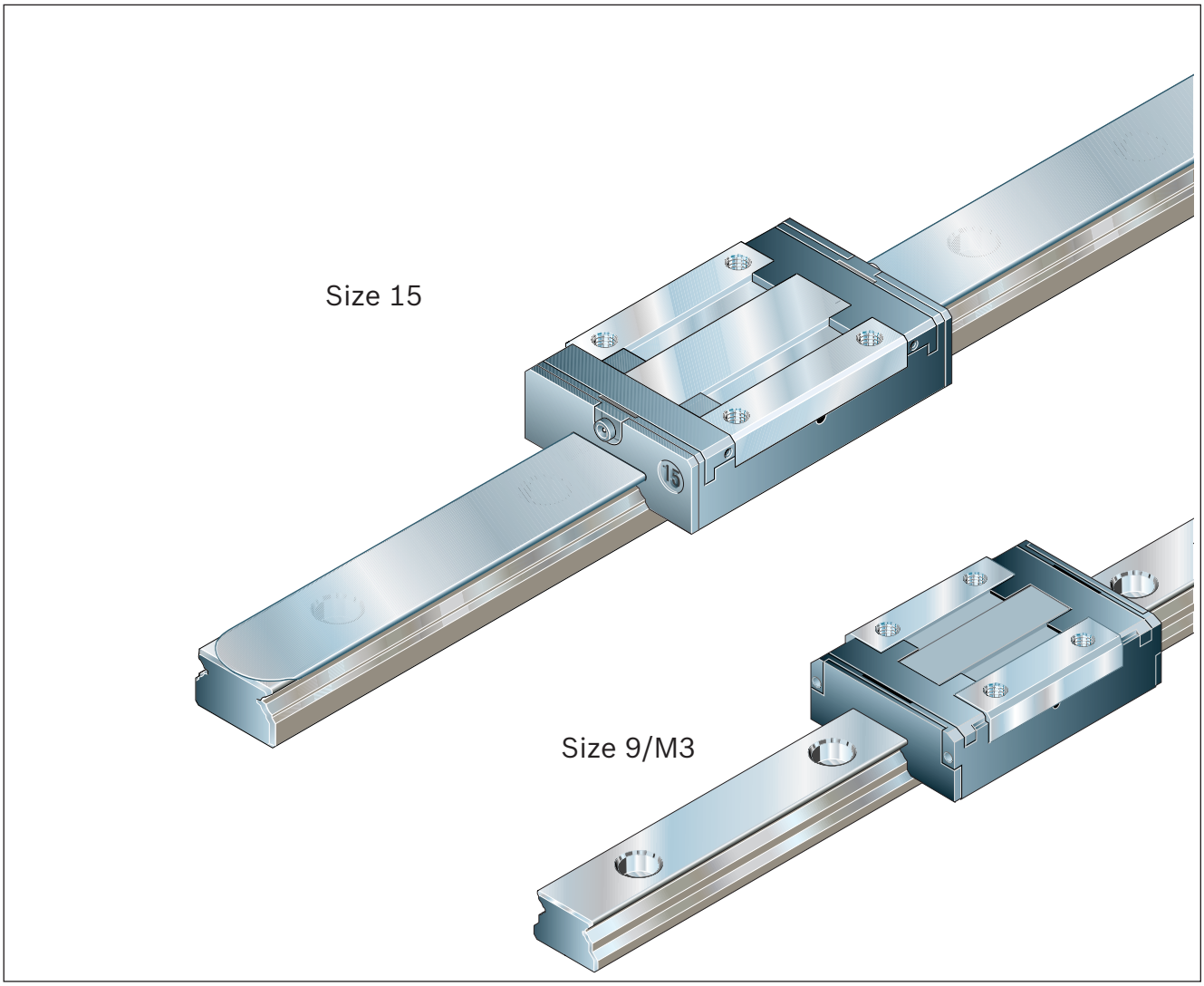
Miniature ball rail systems

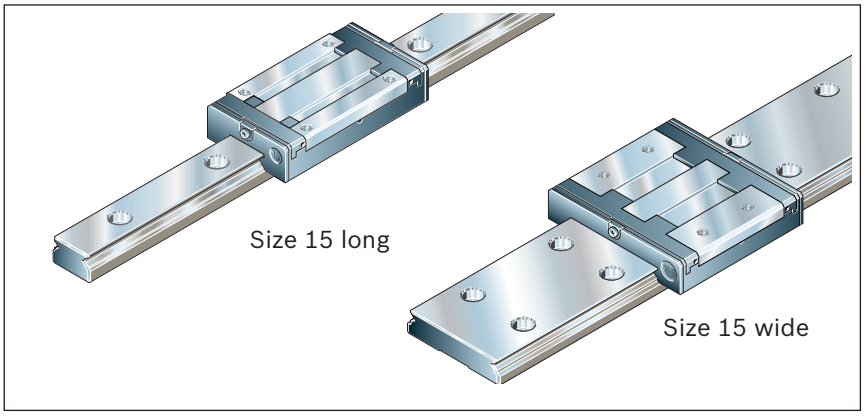
Product overview

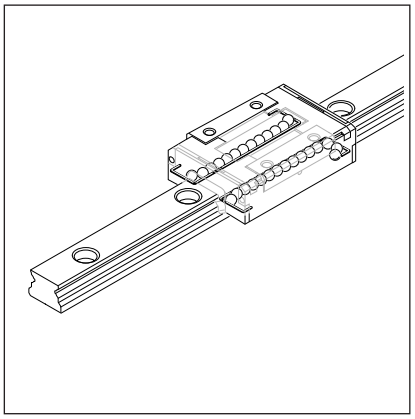
The miniature version of the ball rail systems has been developed for a variety of applications which require ball-bearing longitudinal guides with extremely small size and high load-bearing capacity:

- Textile machinery
- Laboratory automation
- Medical technology
- Automation technology
- Fine mechanics
- Handling and robotics
- Semiconductor industry
- Optical industry

The guide units have exactly the same load ratings in all four high load directions, high load-bearing capacity in all directions of load, including high load torques about all axes, due to a design of largest possible ball sizes.
They are characterized by optimal discharge and low friction.
From size 15 onwards, there is a lubricating nipple on the face and a lateral relubrication option.
Optionally available from size 9 is a cover strip made of stainless steel to close the fixing holes.
All steel parts of the runner block and the guide rail are made of corrosion-resistant, martensitic steel.







- Accuracy classes P, H and N
- Built-in lube ports
- Smooth running thanks to optimized ball recirculation and guidance
- Easy mounting due to ball retention

General technical data and calculations

Definition of dynamic load capacity

The radial loading of constant magnitude and direction which a linear rolling bearing can theoretically endure for a nominal life of 10^5 meters distance traveled (as per DIN 636 Part 2).

Definition of static load capacity

The static loading in the direction of load which corresponds to a calculated stress of 4200 M_{Pa} at the center of the most heavily loaded rolling-element/raceway (rail) contact with a ball conformity of $f_r \leq 0.52$, and 4600 M_{Pa} with a ball conformity of $f_r \geq 0.6$.

Note:
With this contact stress, a permanent overall deformation of the rolling element and the raceway will occur at the contact point corresponding to approx. 0.0001 times the rolling element diameter (as per DIN 636 Part 2).

Definition and calculation of the nominal life

The calculated service life which an individual linear rolling bearing, or a group of apparently identical rolling element bearings operating under the same conditions, can attain with a 90% probability, with contemporary, commonly used materials and manufacturing quality under conventional operating conditions (to DIN 636 Part 2).

Calculate the nominal life L or L_h according to formula (1), (2) or (3):

Nominal life at constant speed

(1) $$L = \left(\frac{C}{F_m}\right)^3 \cdot 10^5$$

(2) $$L_h = \frac{L}{2 \cdot s \cdot n_s \cdot 60}$$

Nominal life at variable speed

(3) $$L_h = \frac{L}{3600 \cdot v_m}$$

(4) $$v_m = \frac{q_{t1} \cdot |v_1| + q_{t2} \cdot |v_2| + ... + q_{tn} \cdot v_n}{100\%}$$

C	=	dynamic load capacity	(N)
F_m	=	equivalent dynamic load	(N)
L	=	nominal life	(m)
L_h	=	nominal life	(h)
n_s	=	stroke repetition rate (full cycles)	(min^{-1})
q_{t1}, q_{t2}...q_{tn}	=	discrete time steps for v_1, v_2...v_n	(%)
s	=	length of stroke	(m)
v_1, v_2...v_n	=	travel speeds	(m/s)
v_m	=	average speed	(m/s)

Equivalent dynamic load on bearing for calculation of service life

If the bearing is subject to variable loads, the equivalent dynamic load F_m must be calculated according to formula (5):

F_m = equivalent dynamic load (N)
F_{eff1}, F_{eff2} ...F_{effn} = discrete load steps (N)
q_{s1}, q_{s2} ... q_{sn} = discrete travel steps for F_{eff1}, F_{eff2} ... F_{effn} (%)

For variable load on bearing

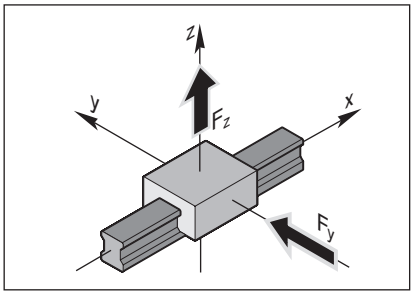
$$(5)\quad F_m = \sqrt[3]{|F_{eff1}|^3 \cdot \frac{q_{s1}}{100\%} + |F_{eff2}|^3 \cdot \frac{q_{s2}}{100\%} + \ldots + |F_{effn}|^3 \cdot \frac{q_{sn}}{100\%}}$$

For combined load on bearing

The combined equivalent load on bearing F_{comb} resulting from combined vertical and horizontal external loads is calculated according to formula (6):

Note:
The structure of the Ball Rail System permits this simplified calculation.

$$(6)\quad F_{comb} = |F_y| + |F_z|$$



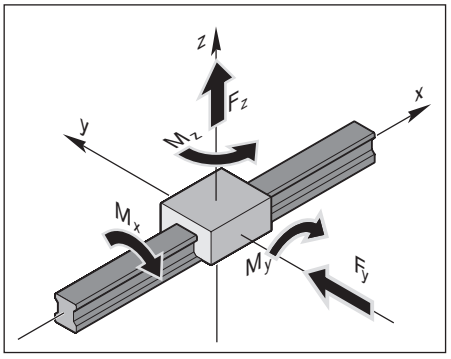
C = dynamic load capacity [2] (N)
F_{comb} = combined equivalent load on bearing (N)
F_y, F_z = dyn. external loads [1] (N)
M_L = dyn. longitudinal moment load capacity [2] (Nm)
M_t = dyn. torsional moment load capacity [2] (Nm)
M_x = dyn. torsional moment about the x-axis (Nm)
M_y = dyn. longitudinal moment load about the y-axis (Nm)
M_z = dyn. longitudinal moment load about the z-axis (Nm)

For combined load on the bearing in conjunction with a torsional moment

The combined equivalent load on bearing F_{comb} resulting from combined vertical and horizontal external loads in conjunction with a torsional moment is calculated according to formula (7):

Formula (7) applies only when using a single guide rail.

$$(7)\quad F_{comb} = |F_y| + |F_z| + C \cdot \frac{|M_x|}{M_t} + C \cdot \frac{|M_y|}{M_L} + C \cdot \frac{|M_z|}{M_L}$$



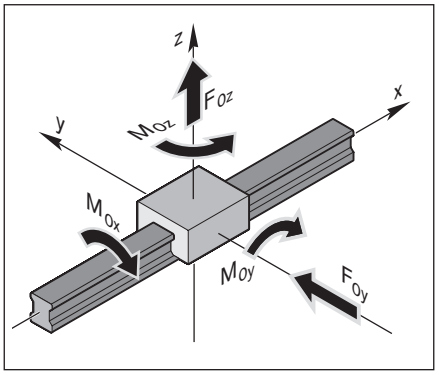
General technical data and calculations

Equivalent static load on bearing

For combined static external loads – vertical and horizontal – in conjunction with a static torsional moment load, calculate the combined equivalent static load on the bearing F_{0comb} using formula (8). The combined equivalent static load on the bearing F_{0comb} must not exceed the static load capacity C_0.

Formula (8) applies only when using a single guide rail.

$$(8)\quad F_{0comb} = |F_{0y}| + |F_{0z}| + C_0 \cdot \frac{|M_{0x}|}{M_{t0}} + C_0 \cdot \frac{|M_{0y}|}{M_{L0}} + C_0 \cdot \frac{|M_{0z}|}{M_{L0}}$$



C_0	=	static load capacity 2)	(N)
F_{0comb}	=	combined equivalent load on bearing	(N)
F_{0y}, F_{0z}	=	stat. external load 1)	(N)
M_{0x}	=	stat. torsional moment load about the x-axis	(Nm)
M_{0y}	=	stat. longitudinal moment load about the y-axis	(Nm)
M_{0z}	=	stat. longitudinal moment load about the z-axis	(Nm)
M_{t0}	=	stat. torsional moment load 2)	(Nm)
M_{L0}	=	stat. longitudinal moment load 2)	(Nm)

1) An external load acting at an angle on the runner block is to be broken down into its F_y and F_z components, and these values are then are then to be used in formula.
2) See tables

Static load safety factor S_0

You must verify mathematically any structural design involving rolling contact with regard to the static load safety factor. The static load safety factor for a linear guide results from the following equation:

$$S_0 = \frac{C_0}{F_{0\,max}}$$

S_0 = static load safety factor
C_0 = static load capacity (N)
F_{0max} = maximum static load (N)

In this connection, $F_{0\,max}$ represents the maximum load amplitude that can occur, which can affect the linear guide. It does not matter whether this load is exerted only for a short period. It may represent the peak amplitude of an overall dynamic loading. For dimensioning, the data shown in the table applies.

Static load safety factor S_0	**Conditions of use**
Overhead hanging arrangements or applications with serious potential risks	≥ 12
High dynamic load when at standstill, contamination.	8 – 12
Normal dimensioning of machinery and plant without full knowledge of the load parameters or connection details.	5 – 8
Full knowledge of all the load data. Vibration-free operation is ensured.	3 – 5

Technical data

Travel speed

$v_{max} = 3$ m/s

Speeds of up to 5 m/s are possible. Service life is limited by wear of plastic parts.

Acceleration

$a_{max} = 250$ m/s²

Only with preloaded systems.
For non-preloaded systems:
$a_{max} = 50$ m/s²

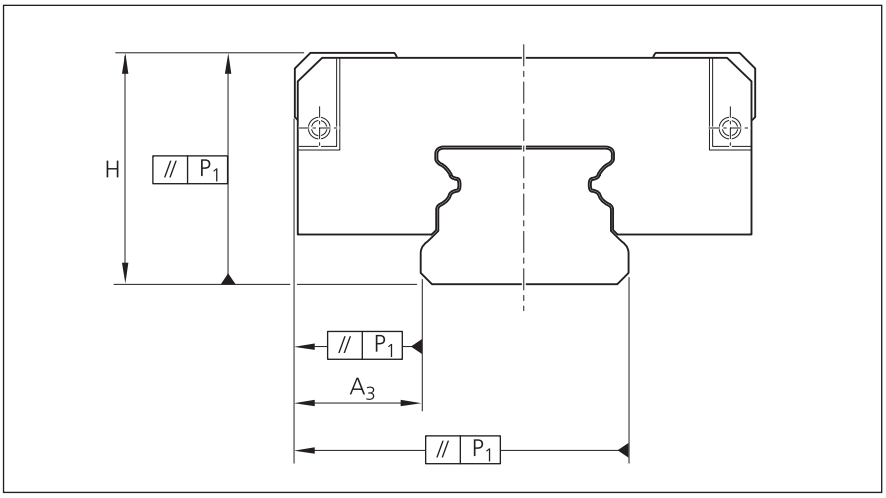
Operating temperature range

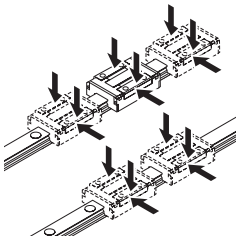
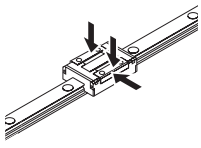
–10 °C ... 80 °C

Brief peaks up to100 °C are permissible.

Accuracy classes and their tolerances (µm)

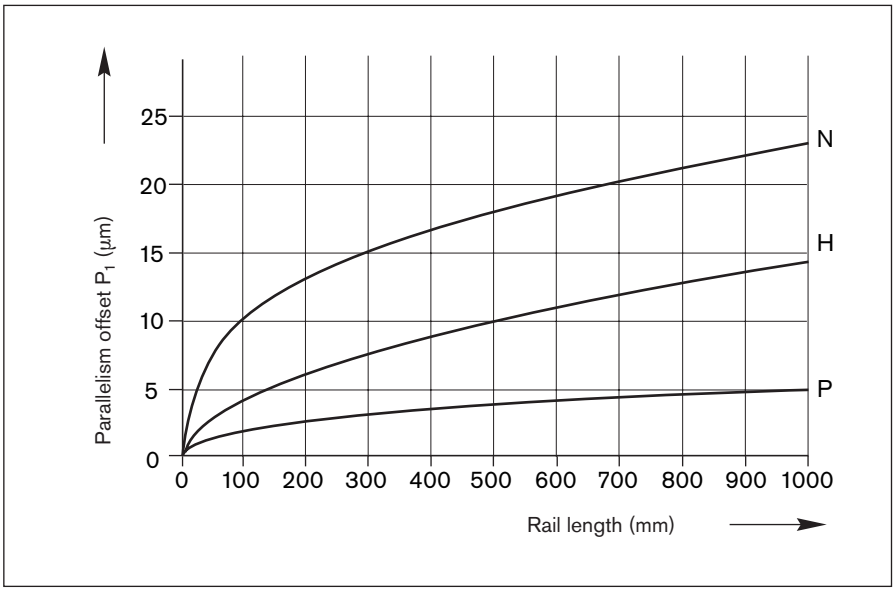
Miniature ball rail systems are offered in 3 different accuracy classes.



Accuracy class	**Dimensional tolerance** (µm)		**Max. difference in dimensions H and A_3 on the same rail**
	H	**A_3**	**ΔH, ΔA_3** (µm)
P	± 10	± 10	7
H	± 20	± 20	15
N	± 30	± 30	20
			
Measured at middle of runner block[1)]	For any block/rail combination at any position on rail		For different runner blocks at same position on rail

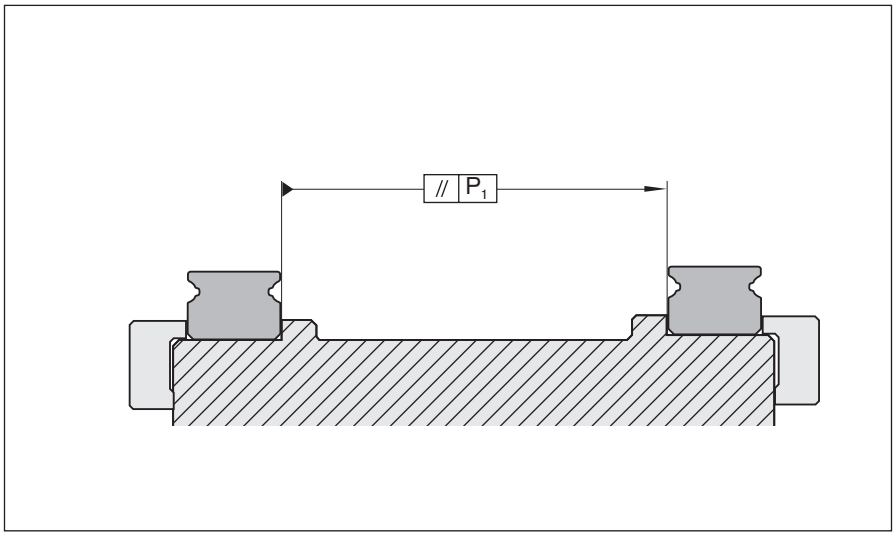
1) For dimensions H and ΔH, the middle of the runner block is calculated from the mean of the two measuring points shown.

Parallelism offset P_1 of the ball rail system in service



Parallelism offset of the installed rails

measured on the guide rails and on the runner blocks

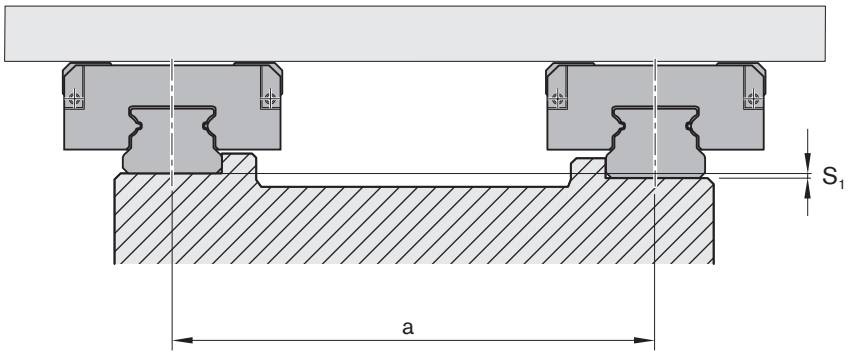


Size	Parallelism offset P_1 (mm)	
	Clearence	Preload
Standard guide rails R0445		
7	0.004	0.002
9/M3	0.005	0.002
12	0.008	0.004
15	0.017	0.008
20	0.025	0.016
Wide guide rails R0455		
9/M3	0.010	0.004
12 B	0.014	0.006
15 B	0.018	0.011

Technical data

Vertical offset

Permissible vertical offset in transverse direction S_1
The permissible vertical offset S_1 includes the tolerance for dimension H (see accuracy classes).

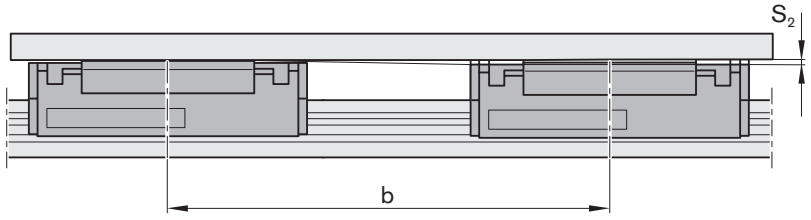


$$S_1 = a \cdot Y$$

S_1 = permissible vertical offset (mm)
a = distance between guide rails (mm)
Y = calculation factor

Calculation factor	For preload class	
	Clearance	Preload
Y	$3.0 \cdot 10^{-4}$	$1.5 \cdot 10^{-4}$

Permissible vertical offset in longitudinal direction S_2
The permissible vertical offset S_2 includes the tolerance “max difference of dimension H on the same rail” ΔH (see accuracy classes).



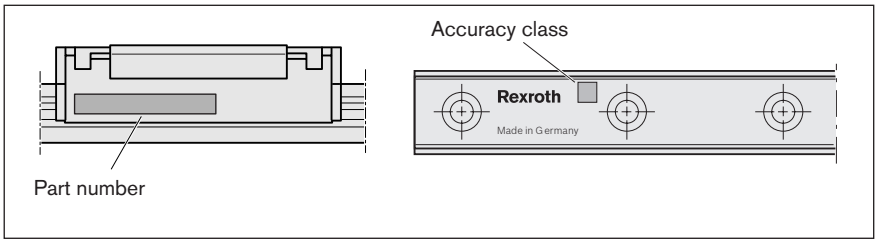
$$S_2 = b \cdot 7 \cdot 10^{-5}$$

S_2 = permissible vertical offset (mm)
b = distance between runner blocks (mm)

Preload and clearance

Preload class	Accuracy class			
	P		H	N
	1	1	9	9
Preload and clearance	~0 to moderate preload	~0 to moderate preload	~0 to moderate clearance	Moderate clearance to moderate preload

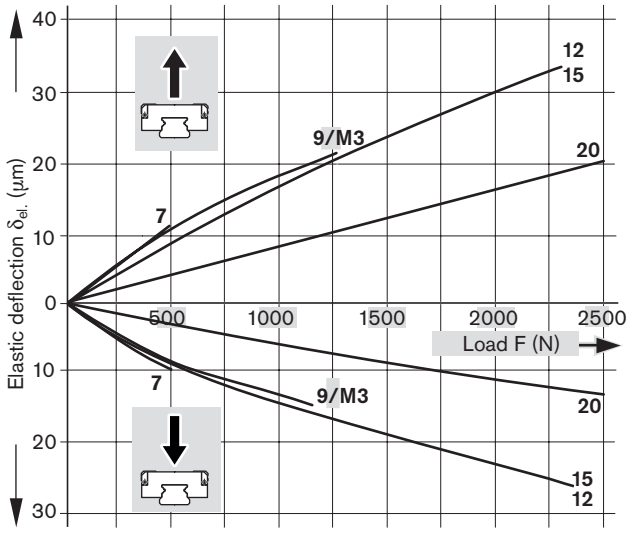
Markings on runner block and guide rail



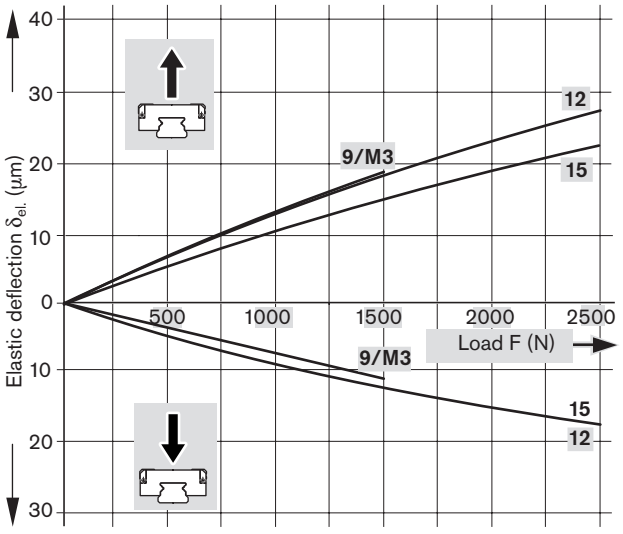
Rigidity of the miniature ball rail system when preloaded

Runner block mounted with 4 screws, strength class 12.9

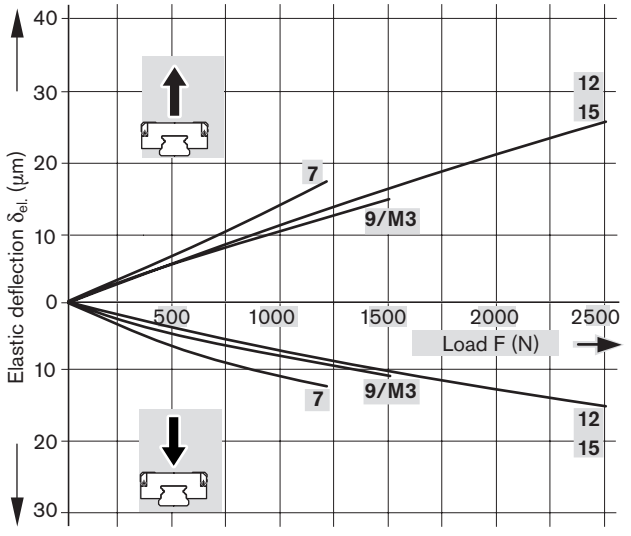
Standard runner block R0442



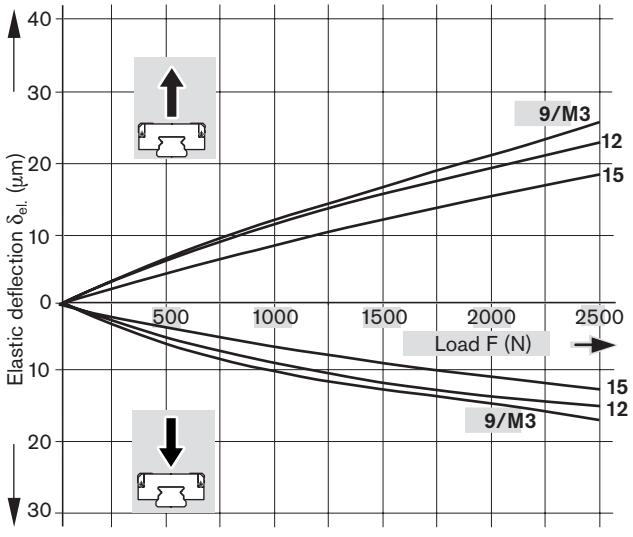
Wide runner block R0443



Long runner block R0444



Wide, long runner block R0441



Lift-off load

Down load

Technical data

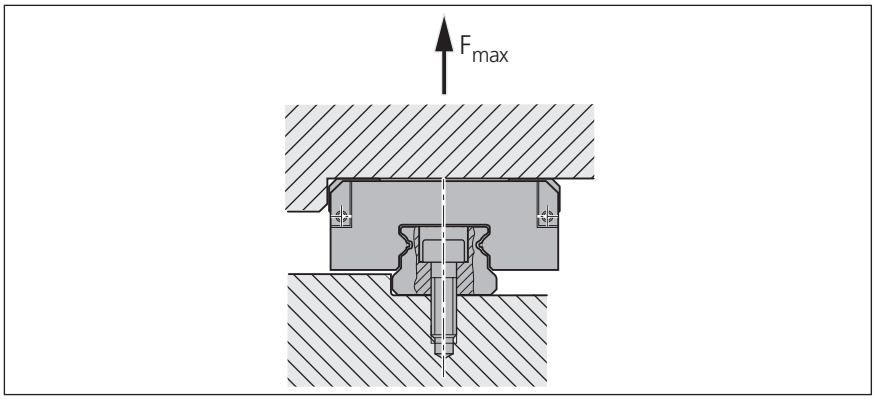
General Notes

The screw connections specified in the DIN 645-1 standard can be overstressed due to the high performance capability of profiled rail systems. The most critical point is the screw connection between the guide rail and the mounting base. If the lift-off loads (F) or moments (M_t) are higher than the respective load values given in the table, the screw connections must be recalculated separately.

The data applies for the following conditions:
- Mounting screw quality 12.9
- Screws tightened using a torque wrench
- Screws lightly oiled
  (For screws in quality 8.8, an approximation factor of 0.6 can be applied)

Miniature ball rail systems

Guide Rails	Runner blocks R0442			Runner blocks R0444	
	Size	$F_{max.}$ (N)	$M_{tmax.}$ (Nm)	$F_{max.}$ (N)	$M_{tmax.}$ (Nm)
R0445	7	1000	3.2	1150	3.7
	12	–	–	4300	23.7
	15	3740	26.0	4280	30.0
	No restriction for sizes				
R0445	R0442:		9/M3, 12 and 20		
	R0444:		9/M3		
R0455	R0441,R0443:		9/M3, 12 and 15		



Friction and seals

The total friction force of the runner blocks is made up of the "runner block friction force" and the "seal friction force". For special applications with a defined displacement force, the runner block and guide rail are matched to each other. Runner blocks are pushed onto the guide rail and supplied as a unit.

The runner blocks are equipped with low-friction seals as standard (limited wiping action at very low friction force).
Part number: R044. ... 01
(See tables "Runner block part numbers")

Optionally runner block with N-seal:
The runner blocks are also available with N-seal (very good wiping action with increased friction force).
Part number: R044. ... 00
(Otherwise as tables "Runner block part numbers))

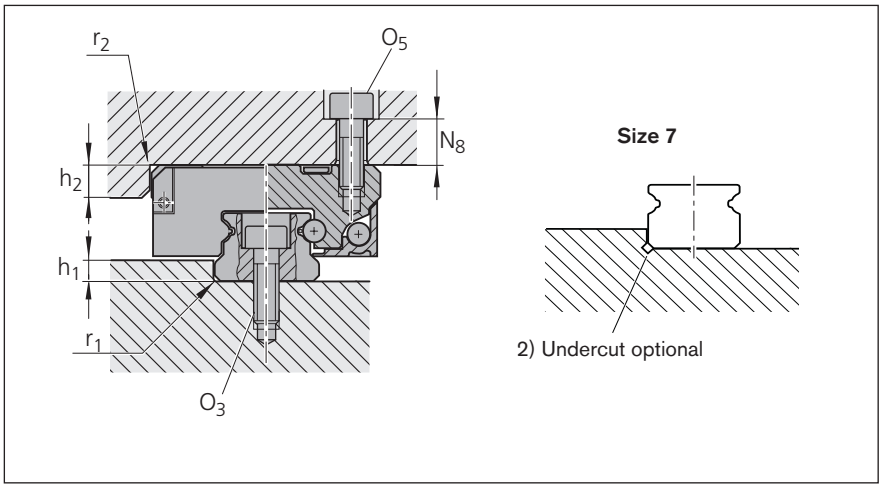
Sizes 15, 20, 9/M3 wide, 12 wide, 15 wide and long runner blocks of sizes 9/M3, 12 and 15, additionally completely sealed with longitudinal seal.

Friction

The friction coefficient μ of Rexroth's miniature ball rail system is approximately 0.002 to 0.003 (without the friction of the seal).

Mounting instructions

Reference edges, corner radii, screw sizes and tightening torques



Size	h_1 (mm)	r_1 max. (mm)	h_2 (mm)	r_2 max. (mm)	O_5 ISO 4762[1] 4 pcs.	O_3 ISO 4762[1] (rail)	N_8 (mm)
Standard runner block R0442							
7	1.2 $_{-0.1}$	0.1[2]	2.2	0.3	M2x5	M2x5	3.0
9/M3	1.5 $_{-0.2}$	0.3	2.5	0.3	M3x8	M3x8	5.0
12	2.5 $_{-0.5}$	0.3	3.5	0.5	M3x8	M3x8	5.0
15	2.8 $_{-0.5}$	0.5	4.5	0.5	M3x8	M3x10	4.5
20	6.3 $_{-0.5}$	0.5	6.5	0.5	M4x12	M5x14	6.5
Long runner block R0444							
7	1.2 $_{-0.1}$	0.1[2]	2.2	0.3	M2x5	M2x5	3.0
9/M3	1.0 $_{-0.1}$	0.3	2.5	0.3	M3x8	M3x8	5.0
12	2.0 $_{-0.2}$	0.3	3.5	0.5	M3x8	M3x8	5.0
15	2.8 $_{-0.5}$	0.5	4.5	0.5	M3x8	M3x10	4.5
Wide runner block R0443; wide, long R0441							
9/M3	1.8 $_{-0.2}$	0.3	2.5	0.3	M3x8	M3x8	5.5
12	2.8 $_{-0.5}$	0.5	3.0	0.4	M3x8	M4x10	4.5
15	2.8 $_{-0.5}$	0.5	4.5	0.5	M4x10	M4x12	6.0

1) Formerly DIN 912

Tightening torques for the mounting screws

$\mu K = \mu G = 0.125$

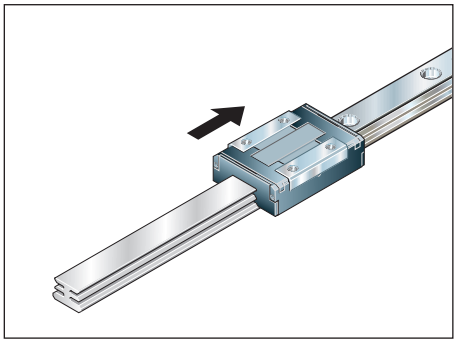
8.8		M2	M3	M4	M5
Nm	**A2-70**	0.35	1.1	2.0	3.9
	12.9	0.50	2.1	4.6	9.5

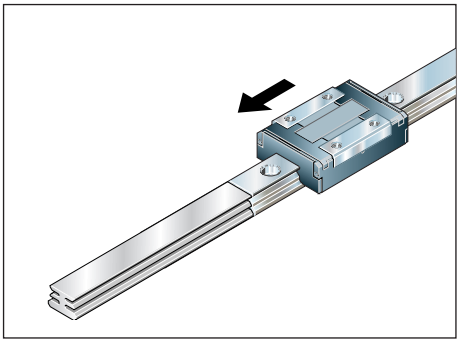
Note on installation

The runner blocks are delivered mounted on a plastic arbor.

– Position the runner block complete with the arbor at the head of the rail and push on; the arbor will thus be pushed out of the runner block.

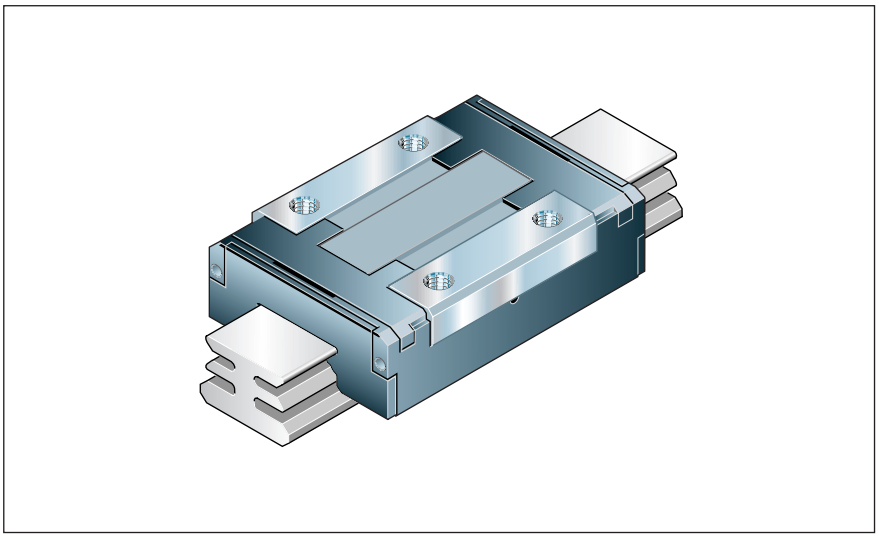
When removing the runner block, carry out the above operations in reverse sequence.





SNS – slimline, normal, standard height, R0442 ... ..

All steel parts of the runner block are made of corrosion-resistant, martensitic steel.
The runner blocks are delivered mounted on arbors.



Part numbers for runner blocks

Standard seals: low-friction seals.
Part number: R0442 ... **01**
(see table)
Special versions:
Runner blocks are also available:

- with N seals
  (excellent wiping action)
  Sizes 15 and 20 have additional longitudinal seals for full sealing.
  Part number: R0442 ... **00**
  (otherwise as per table)
- without basic lubrication for individual lubrication.
  - sizes 15 and 20 additionally with N seals and longitudinal seals
    Part number: R0442 ... **40**
    (otherwise as per table)
  - with low-friction seals
    Part number: R0442 ... **41**
    (otherwise as per table)

Size	Accuracy class	Part numbers for runner blocks	
		Clearance 9	Preload 1
7	P	-	R0442 712 01
	H	R0442 793 01	R0442 713 01
	N	R0442 794 01	-
9/M3	P	–	R0442 812 01
	H	R0442 893 01	R0442 813 01
	N	R0442 894 01	–
12	P	–	R0442 212 01
	H	R0442 293 01	R0442 213 01
	N	R0442 294 01	–
15	P	–	R0442 512 01
	H	R0442 593 01	R0442 513 01
	N	R0442 594 01	–
20	P	–	R0442 012 01
	H	R0442 093 01	R0442 013 01
	N	R0442 094 01	–

Take frictional drag of the respective seals into account.
See “Technical Data”, section “Friction and seals”.

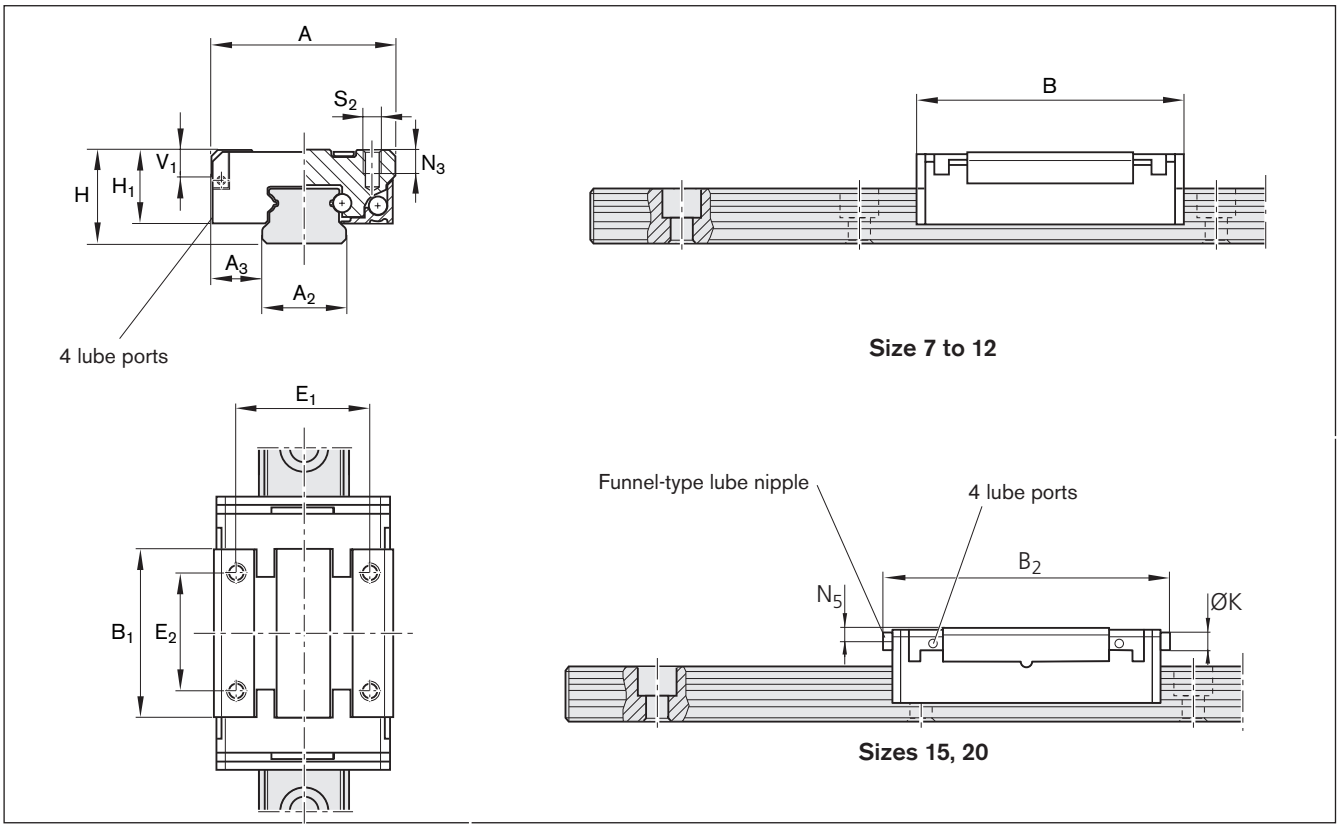
Note on dynamic load capacities and moments (see table)
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m.
Often only 50,000 m are actually stipulated.
For comparison:
Multiply values **C, M_t** and **M_L** from the table by 1.26.

Ordering example 1:
Runner block size 12, accuracy class P, preloaded, standard seals
Ordering data: **R0442 212 01**

Ordering example 2:
Runner block size 7, accuracy class H, clearance, N seals
Ordering data: **R0442 793 00**

Ordering example 3:
Runner block size 15, accuracy class H, preloaded, N seals and longitudinal seals, no basic lubrication
Ordering data: **R0442 513 40**

Ordering example 4:
Runner block size 9/M3, accuracy class N, clearance, standard seals, no basic lubrication
Ordering data: **R0442 894 41**



Size	Dimensions (mm)															
	A	A_2	A_3	B	B_1	B_2	H	H_1[1]	H_1[2]	V_1	E_1	E_2	K	N_3	N_5	S_2
7	17	7	5.0	24.0	14.9	–	8	6.5	–	2.0	12	8	–	2.5	–	M2
9/M3	20	9	5.5	31.0	20.7	–	10	8.0	–	2.8	15	10	–	3.0	–	M3
12	27	12	7.5	34.8	21.6	–	13	10.0	–	3.3	20	15	–	3.5	–	M3
15	32	15	8.5	43.0	27.2	46	16	12.0	12.65	4.7	25	20	4	4.0	2.1	M3
20	46	20	13.0	66.0	45.1	69	25	17.5	18.15	7.0	38	38	4	6.0	3.1	M4

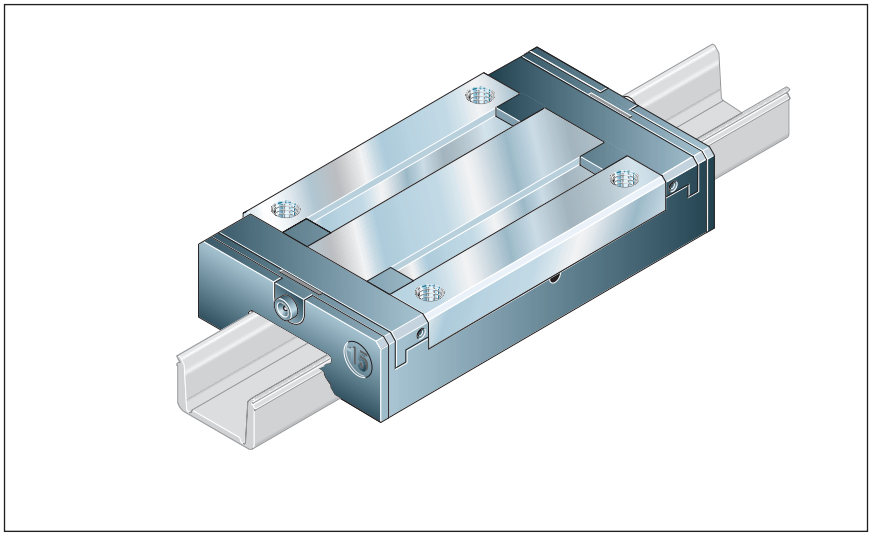
1) Without longitudinal seal
2) With longitudinal seal

Size	Weight Runner block (g)	Load capacities (N)		Load moments (Nm)			
		C[1]	C_0[1]	M_t[2]	M_{t0}[2]	M_L[2]	M_{L0}[2]
7	9	860	1400	3.1	5.1	1.9	3.2
9/M3	16	1180	2100	5.4	9.6	3.6	6.4
12	33	2310	3470	13.7	20.6	7.9	11.8
15	47	4200	6260	31.2	46.3	18.3	27.0
20	177	7900	12230	81.4	126.0	51.7	80.0

1) Calculated values conforming to DIN 636, Part 2
2) Calculated values (based on C, C_0)

SLS – slimline, long, standard height, R0444 ... ..

All steel parts of the runner block are made of corrosion-resistant, martensitic steel.
The runner blocks are delivered mounted on arbors.



Part numbers for runner blocks

Standard seals: low-friction seals.
Part number: R0444 ... **01**
(see table)
Special versions:
Runner blocks are also available:

- with N seals
  (excellent wiping action)
  Sizes 9/M3, 12 and 15 have additional longitudinal seals for full sealing.
  Part number: R0444 ... **00**
  (otherwise as per table)
- without basic lubrication for individual lubrication.
  - sizes 9/M3, 12 and 15 additionally with N seals and longitudinal seals.
    Part number: R0444 ... **40**
    (otherwise as per table)
  - with low-friction seals
    Part number: R0444 ... **41**
    (otherwise as per table)

Size	Accuracy class	Part numbers for runner blocks	
		Clearance 9	Preload 1
7	P	–	R0444 712 01
	H	R0444 793 01	R0444 713 01
	N	R0444 794 01	–
9/M3	P	–	R0444 812 01
	H	R0444 893 01	R0444 813 01
	N	R0444 894 01	–
12	P	–	R0444 212 01
	H	R0444 293 01	R0444 213 01
	N	R0444 294 01	–
15	P	–	R0444 512 01
	H	R0444 593 01	R0444 513 01
	N	R0444 594 01	–

Take frictional drag of the respective seals into account.
See “Technical Data”, section “Friction and seals”.

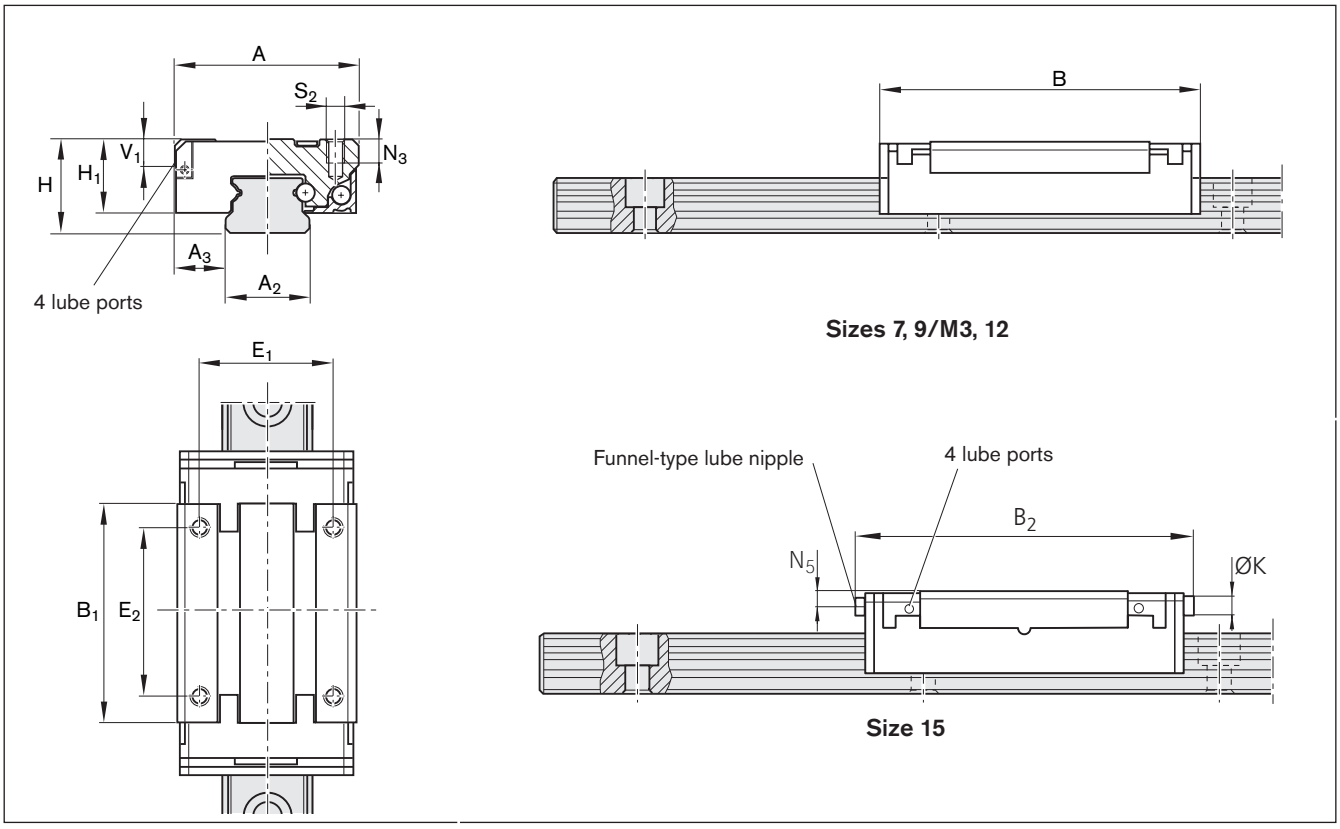
Note on dynamic load capacities and moments (see table)
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m.
Often only 50,000 m are actually stipulated.
For comparison:
Multiply values **C, M_t** and **M_L** from the table by 1.26.

Ordering example 1:
Runner block size 12, accuracy class P, preloaded, standard seals
Ordering data: **R0444 212 01**

Ordering example 2:
Runner block size 7, accuracy class H, clearance, N seals
Ordering data: **R0444 793 00**

Ordering example 3:
Runner block size 15, accuracy class H, preloaded, N seals and longitudinal seals, no basic lubrication
Ordering data: **R0444 513 40**

Ordering example 4:
Runner block size 9/M3, accuracy class N, clearance, standard seals, no basic lubrication
Ordering data: **R0444 894 41**



Size	Dimensions (mm)															
	A	A_2	A_3	B	B_1	B_2	H	H_1[1)]	H_1[2)]	V_1	E_1	E_2	K	N_3	N_5	S_2
7	17	7	5.0	33.0	24.1	–	8	6.5	–	2.0	12	13	–	2.5	–	M2
9/M3	20	9	5.5	41.4	31.3	–	10	8.0	8.65	2.8	15	16	–	3.0	–	M3
12	27	12	7.5	47.5	34.5	–	13	10.0	10.65	3.3	20	20	–	3.5	–	M3
15	32	15	8.5	60.8	45.0	63.8	16	12.0	12.65	4.7	25	25	4	4.0	2.1	M3

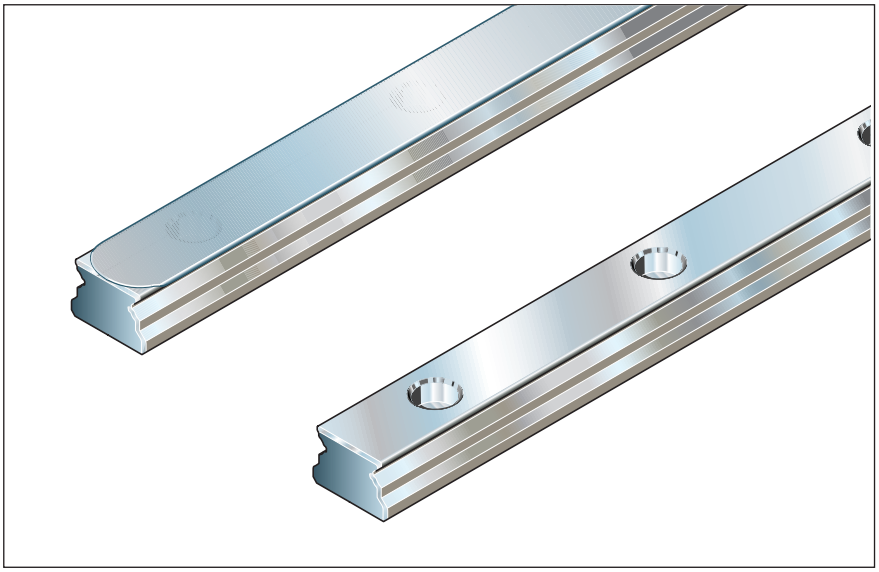
1) Without longitudinal seal
2) With longitudinal seal

Size	Weight Runner block (g)	Load capacities (N)		Load moments (Nm)			
		C[1)]	C_0[1)]	M_t[2)]	M_{t0}[2)]	M_L[2)]	M_{L0}[2)]
7	14	1220	2340	4.5	8.5	4.3	8.3
9/M3	26	1570	3150	7.2	14.5	7.0	14.0
12	51	3240	5630	19.3	33.5	16.8	29.2
15	94	5940	10170	44.0	75.3	39.2	67.1

1) Calculated values conforming to DIN 636, Part 2
2) Calculated values (based on C, C_0)

SNS – standard, miniature ball guide rail without / with cover strip R0445 ... ..

For runner blocks R0442 and R0444.
Guide rails made of corrosion-resistant, martensitic steel.



Part numbers for guide rails

Size	Accuracy class	Part numbers for guide rails Part number, length L (mm) **without** cover strip	 **with** cover strip
7	P	R0445 702 31,....	–
	H	R0445 703 31,....	–
	N	R0445 704 31,....	–
9/M3	P	R0445 802 31,....	R0445 862 31,....
	H	R0445 803 31,....	R0445 863 31,....
	N	R0445 804 31,....	R0445 864 31,....
12	P	R0445 202 31,....	R0445 262 31,....
	H	R0445 203 31,....	R0445 263 31,....
	N	R0445 204 31,....	R0445 264 31,....
15[1)]	P	R0445 502 31,....	R0445 562 31,....
	H	R0445 503 31,....	R0445 563 31,....
	N	R0445 504 31,....	R0445 564 31,....
20	P	R0445 002 31,....	R0445 062 31,....
	H	R0445 003 31,....	R0445 063 31,....
	N	R0445 004 31,....	R0445 064 31,....

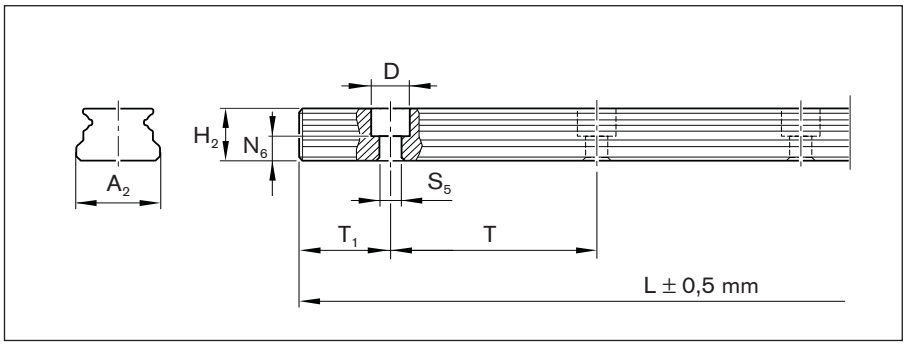
1) Also available in versions for mounting from below (please ask).

Recommended rail lengths

$$L = n_B \cdot T - 4$$

L	=	rail length	(mm)
T	=	hole spacing	(mm)
n_B	=	number of holes	

Dimensions and weights



Size	Dimensions (mm)									Weight
	A_2	H_2[1)]	N_6	D	S_5	T_{1min}	T_{1max}	T	L_{1max}[2)3)]	g/100 mm
7	7	4.7	2.2	4.3	2.5	5.0	11.5	15	1000	22
9/M3	9	5.5	2.2	6.0	3.5	6.0	15.5	20	2000	33
12	12	7.8	3.0	6.0	3.5	6.0	20.5	25	2000	61
15	15	9.5	4.7	6.0	3.5	6.0	35.5	40	2000	97
20	20	15.0	6.5	9.5	6.0	6.5	53.5	60	1000	211

1) Dimensions without cover strip
2) For rail lengths longer than L_{max} factory-made mating sections are joined end-to-end.
3) For special cases one-piece guide rails up to 2000 mm length possible (please ask).

Ordering Examples

☞ If no T_1 is specified by the customer, both ends of the guide rail will be identical. The rail lengths were calculated using the formula for recommended rail lengths.

Ordering example 1
(up to L_{max}):
Guide rail size 12, accuracy class P, recommended rail length 771 mm (30 · T, number of holes $n_B = 31$, T_1 is identical at both ends of the guide rail)
Ordering data: **R0445 202 31, 771 mm**

Ordering example 2
(up to L_{max} with cover strip):
Guide rail size 12 with cover strip, accuracy class P, recommended rail length 771 mm (30 · T, number of holes $n_B = 31$, T_1 at one end of guide rail = 4.5 mm)
Ordering data:
R0445 262 31, 771 mm, T1 = 4.5 mm
(At the other end of the guide rail T_1 = 16.5 mm for production reasons.)

Ordering example 3
(composite rail over L_{max}):
Guide rail size 12, accuracy class N, recommended rail length 1271, mm, **2** sections (50 · T, number of holes $n_B = 51$, T_1 is identical at both ends of the composite guide rail)
Ordering data: **R0445 204 32, 1271 mm**

Number of sections

Ordering example 4
(one-piece over L_{max}):
Guide rail size 12, accuracy class P, recommended rail length 1771 mm (70 · T, number of holes $n_B = 71$, T_1 is identical at both ends of the guide rail)
Ordering data: **R0445 202 31, 1771 mm**

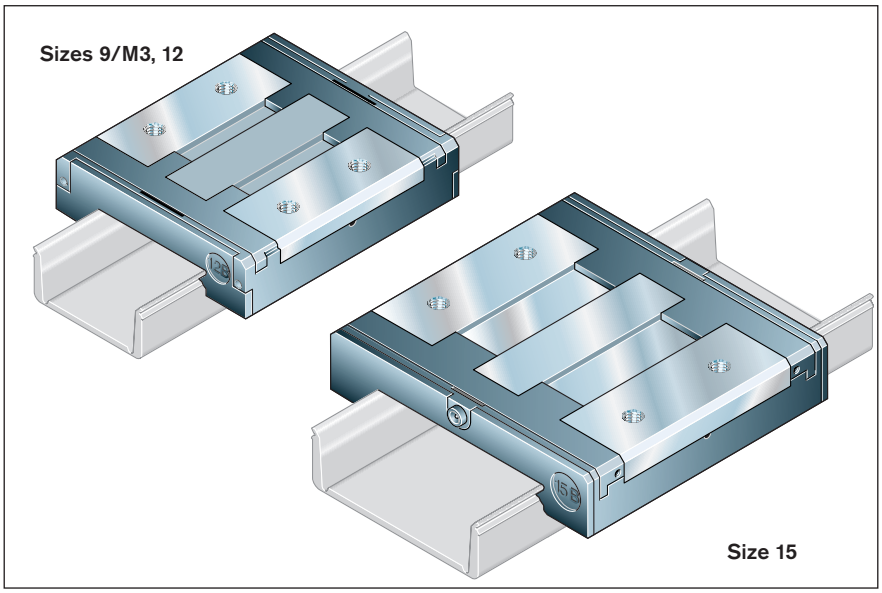
Note on adjacent structures

Permissible mounting hole tolerances for adjacent structures with one-piece guide rails.

Size	Hole position tolerance (mm)
7 - 20	Ø 0.2

BNS – wide, normal, standard hight, R0443 ... ..

All steel parts of the runner block are made of corrosion-resistant, martensitic steel.
The runner blocks are delivered mounted on arbors.



Part numbers for runner blocks

Standard seals: low-friction seals.
Part number: R0443 ... **01**
(see table)
Special versions:
Runner blocks are also available:

- with N seals (excellent wiping action) and longitudinal seals for full sealing.
  Part number: R0443 ... **00**
  (otherwise as per table)
- without basic lubrication for individual lubrication.
  - with N seals and longitudinal seals
    Part number: R0443 ... **40**
    (otherwise as per table)
  - with low-friction seals
    Part number: R0443 ... **41**
    (otherwise as per table)

Size	Accuracy class	Part numbers for runner blocks	
		Clearance **9**	Preload **1**
9/M3	P	–	R0443 812 01
	H	R0443 893 01	R0443 813 01
	N	R0443 894 01	–
12	P	–	R0443 212 01
	H	R0443 293 01	R0443 213 01
	N	R0443 294 01	–
15	P	–	R0443 512 01
	H	R0443 593 01	R0443 513 01
	N	R0443 594 01	–

Take frictional drag of the respective seals into account.
See “Technical Data”, section “Friction and seals”.

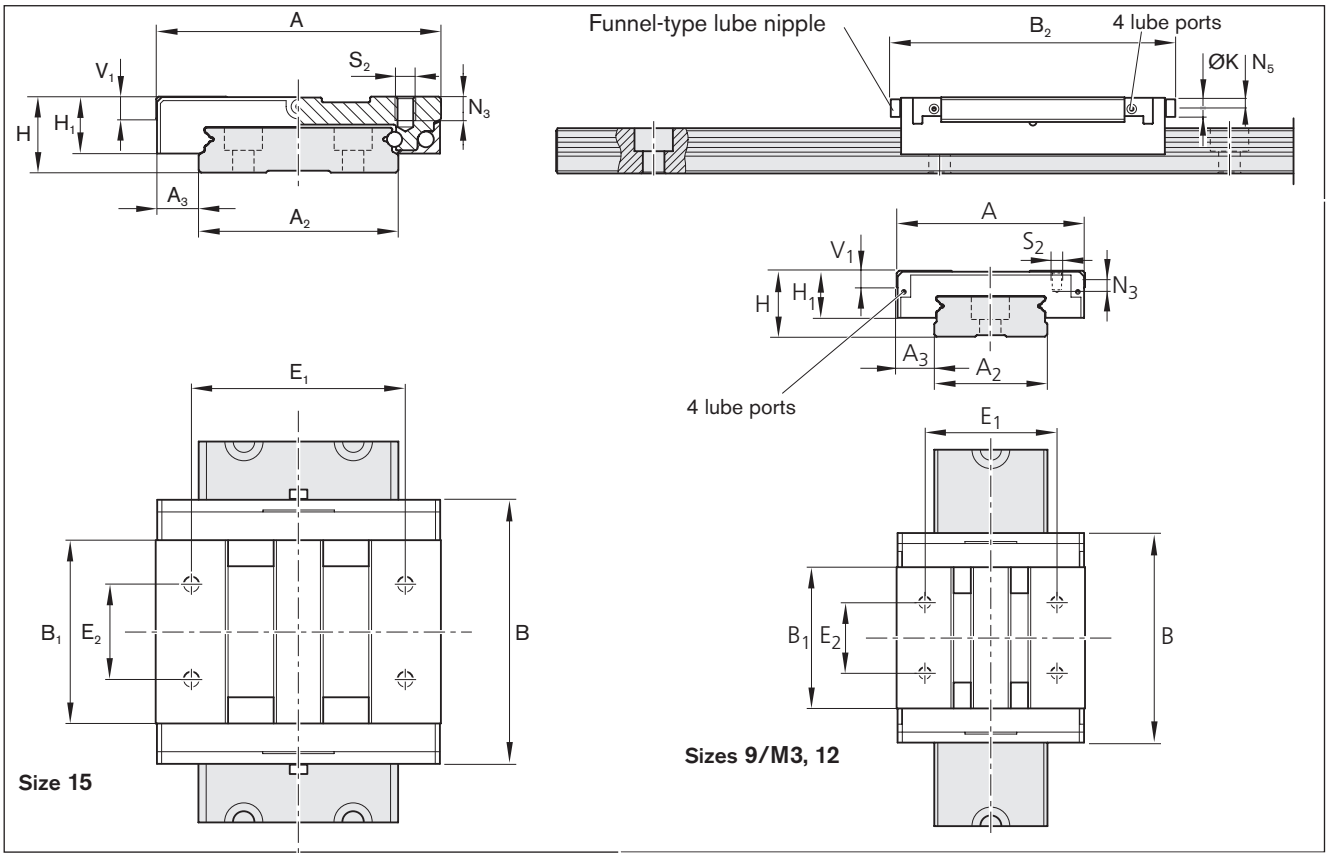
Note on dynamic load capacities and moments (see table)
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m.
Often only 50,000 m are actually stipulated.
For comparison:
Multiply values **C, M_t** and **M_L** from the table by 1.26.

Ordering example 1:
Runner block size 12, accuracy class P, preloaded, standard seals
Ordering data: **R0443 212 01**

Ordering example 2:
Runner block size 12, accuracy class H, clearance, N seals
Ordering data: **R0443 293 00**

Ordering example 3:
Runner block size 15, accuracy class H, preloaded, N seals and longitudinal seals, no basic lubrication
Ordering data: **R0443 513 40**

Ordering example 4:
Runner block size 9/M3, accuracy class N, clearance, standard seals, no basic lubrication
Ordering data: **R0443 894 41**



Size	Dimensions (mm)															
	A	A_2	A_3	B	B_1	B_2	H	H_1[1)]	H_1[2)]	V_1	E_1	E_2	K	N_3	N_5	S_2
9/M3	30	18	6.0	39.0	31.3	–	12	9.0	9.65	2.8	21	12	–	3.2	–	M3
12	40	24	8.0	44.5	34.5	–	14	10.0	10.65	3.3	28	15	–	4.0	–	M3
15	60	42	9.0	55.5	45.0	58.5	16	12.0	12.65	4.7	45	20	4	4.5	2.1	M4

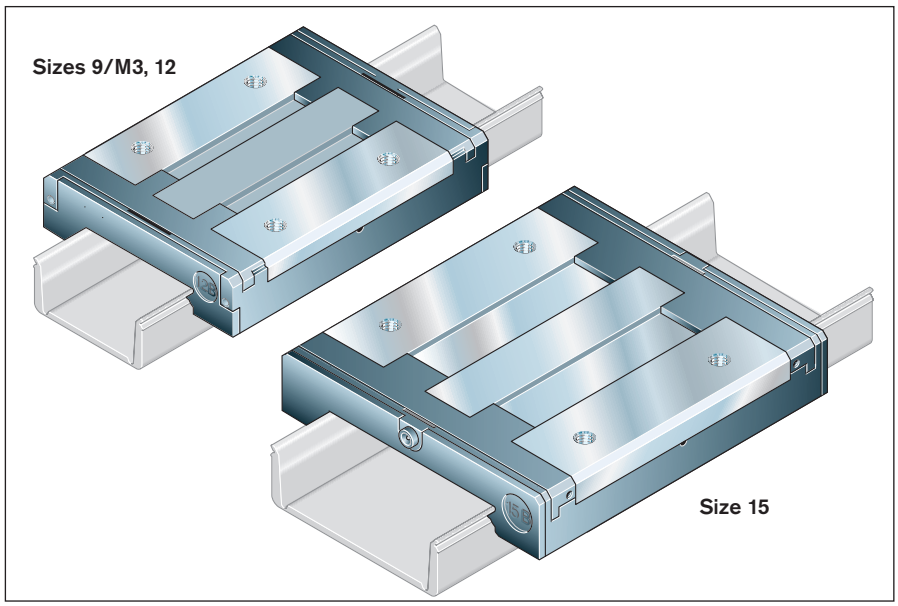
1) Without longitudinal seal
2) With longitudinal seal

Size	Weight Runner block (g)	Load capacities (N)		Load moments (Nm)			
		C[1)]	C_0[1)]	M_t[2)]	M_{t0}[2)]	M_L[2)]	M_{L0}[2)]
9/M3	26	1920	3330	15.9	27.6	7.4	12.9
12	51	3200	5340	37.9	63.2	14.3	23.9
15	110	5285	8610	107.0	174.0	30.0	49.0

1) Calculated values conforming to DIN 636, Part 2
2) Calculated values (based on C, C_0)

BLS – wide, long, standard hight, R0441 ... ..

All steel parts of the runner block are made of corrosion-resistant, martensitic steel.
The runner blocks are delivered mounted on arbors.



Part numbers for runner blocks

Standard seals: low-friction seals.
Part number: R0441 ... **01**
(see table)
Special versions:
Runner blocks are also available:
- with N seals (excellent wiping action) and longitudinal seals for full sealing.
  Part number: R0441 ... **00**
  (otherwise as per table)
- without basic lubrication for individual lubrication.
  - with N seals and longitudinal seals
    Part number: R0441 ... **40**
    (otherwise as per table)
  - with low-friction seals
    Part number: R0441 ... **41**
    (otherwise as per table)

Size	Accuracy class	Part numbers for runner blocks	
		Clearance	Preload
		9	**1**
9/M3	P	–	R0441 812 01
	H	R0441 893 01	R0441 813 01
	N	R0441 894 01	–
12	P	–	R0441 212 01
	H	R0441 293 01	R0441 213 01
	N	R0441 294 01	–
15	P	–	R0441 512 01
	H	R0441 593 01	R0441 513 01
	N	R0441 594 01	–

Take frictional drag of the respective seals into account.
See “Technical Data”, section “Friction and seals”.

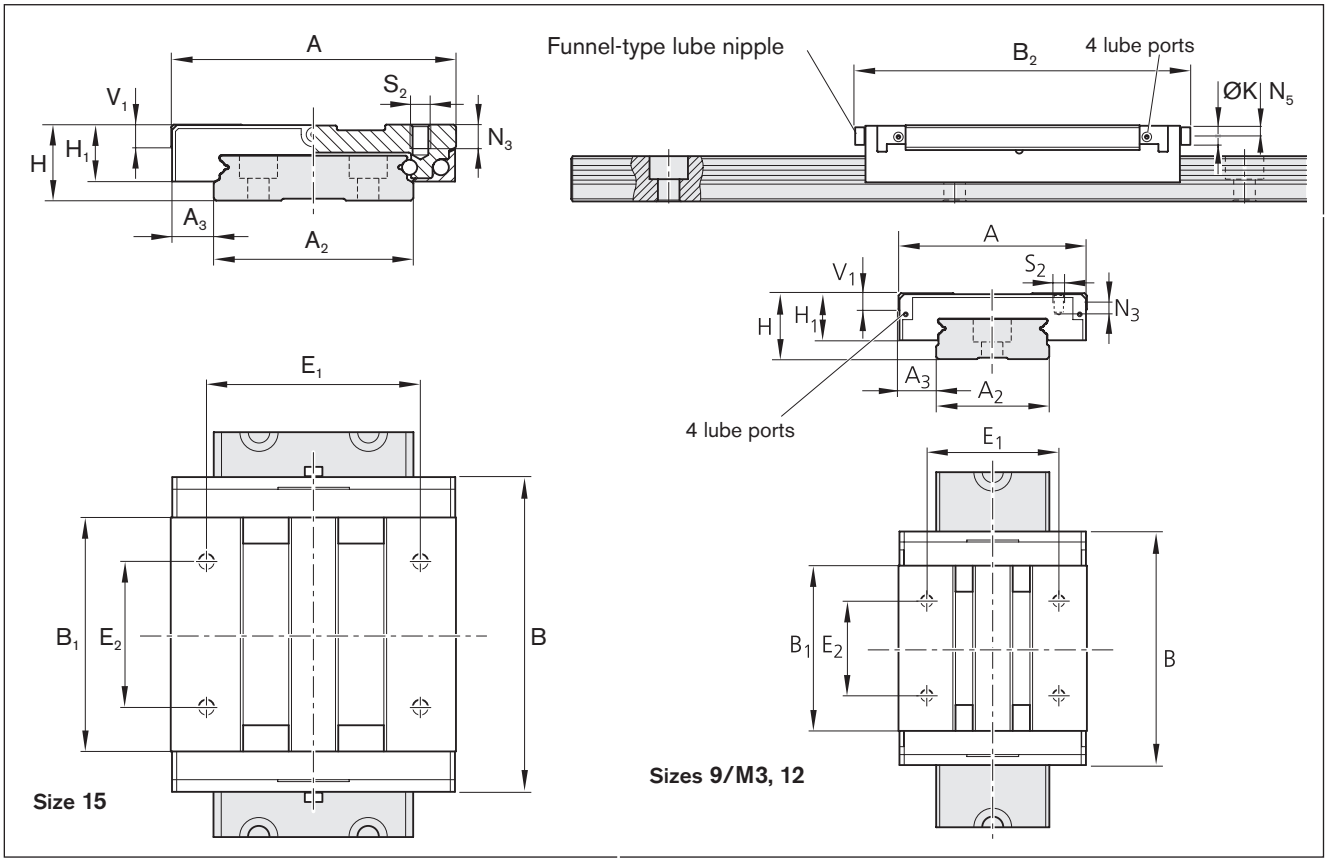
Note on dynamic load capacities and moments (see table)
Determination of the dynamic load capacities and moments is based on a travel life of 100,000 m.
Often only 50,000 m are actually stipulated.
For comparison:
Multiply values **C, M_t** and **M_L** from the table by 1.26.

Ordering example 1:
Runner block size 12, accuracy class P, preloaded, standard seals
Ordering data: **R0441 212 01**

Ordering example 2:
Runner block size 12, accuracy class H, clearance, N seals
Ordering data: **R0441 293 00**

Ordering example 3:
Runner block size 15, accuracy class H, preloaded, N seals and longitudinal seals, no basic lubrication
Ordering data: **R0441 513 40**

Ordering example 4:
Runner block size 9/M3, accuracy class N, clearance, standard seals, no basic lubrication
Ordering data: **R0441 894 41**



Size	Dimensions (mm)															
	A	A_2	A_3	B	B_1	B_2	H	H_1 1)	H_1 2)	V_1	E_1	E_2	K	N_3	N_5	S_2
9/M3	30	18	6.0	51.0	38.0	–	12	9.0	9.65	2.8	23	24	–	3.2	–	M3
12	40	24	8.0	59.5	45.0	–	14	10.0	10.65	3.3	28	28	–	4.0	–	M3
15	60	42	9.0	74.5	57.6	77.5	16	12.0	12.65	4.7	45	35	4	4.5	2.1	M4

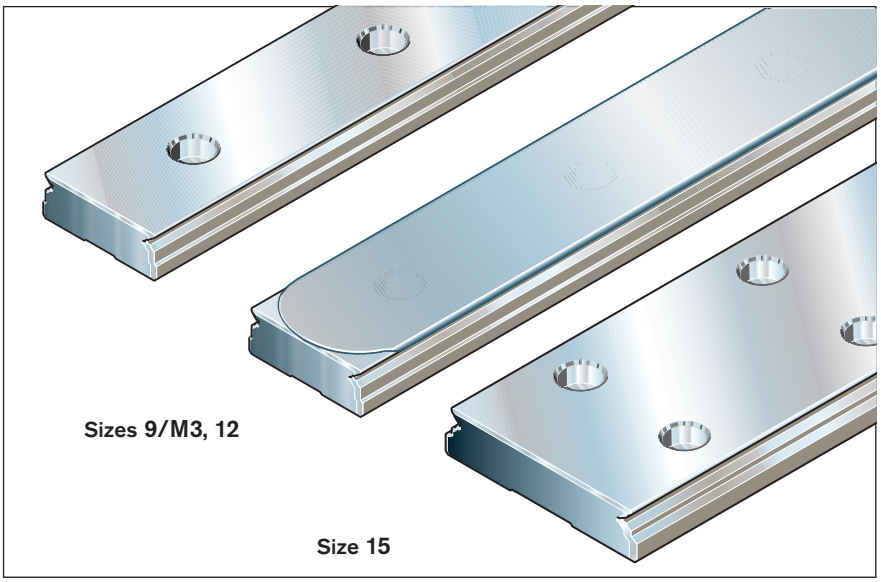
1) Without longitudinal seal
2) With longitudinal seal

Size	Weight Runner block (g)	Load capacities (N)		Load moments (Nm)			
		C 1)	C_0 1)	M_t 2)	M_{t0} 2)	M_L 2)	M_{L0} 2)
9/M3	41	2825	5590	23.5	46.4	15.8	31.2
12	76	4340	8250	51.4	97.7	28.7	54.6
15	170	7460	14085	151.0	285.2	66.1	125.0

1) Calculated values conforming to DIN 636, Part 2
2) Calculated values (based on C, C_0)

BNS – wide, miniature ball guide rail without / with cover strip R0455 ... ..

For runner blocks R0443 and R0441
Mounting hole pattern, size 9/M3, 12:
– single row
Mounting hole pattern, size 15:
– double row
Guide rails made of corrosion-resistant, martensitic steel.



Part numbers for guide rails

Size	Accuracy class	Part numbers for wide guide rails Part number, length L (mm)	
		without cover strip	**with** cover strip
9/M3	P	R0455 802 31,....	R0455 862 31,....
	H	R0455 803 31,....	R0455 863 31,....
	N	R0455 804 31,....	R0455 864 31,....
12	P	R0455 202 31,....	R0455 262 31,....
	H	R0455 203 31,....	R0455 263 31,....
	N	R0455 204 31,....	R0455 264 31,....
15	P	R0455 502 31,....	R0455 562 31,....
	H	R0455 503 31,....	R0455 563 31,....
	N	R0455 504 31,....	R0455 564 31,....

Recommended rail lengths

$$L = n_B \cdot T - 4$$

L = rail length (mm)
T = hole spacing (mm)
n_B = number of holes per row

Ordering Examples

☞ If no T_1 is specified by the customer, both ends of the guide rail will be identical. The rail lengths were calculated using the formula for recommended rail lengths.

Ordering example 1
(up to L_{max}):
Guide rail size 12, accuracy class P, recommended rail length 836 mm (20 · T, number of holes $n_B = 21$, T_1 is identical at both ends of the guide rail)
Ordering data: **R0455 202 31, 836 mm**

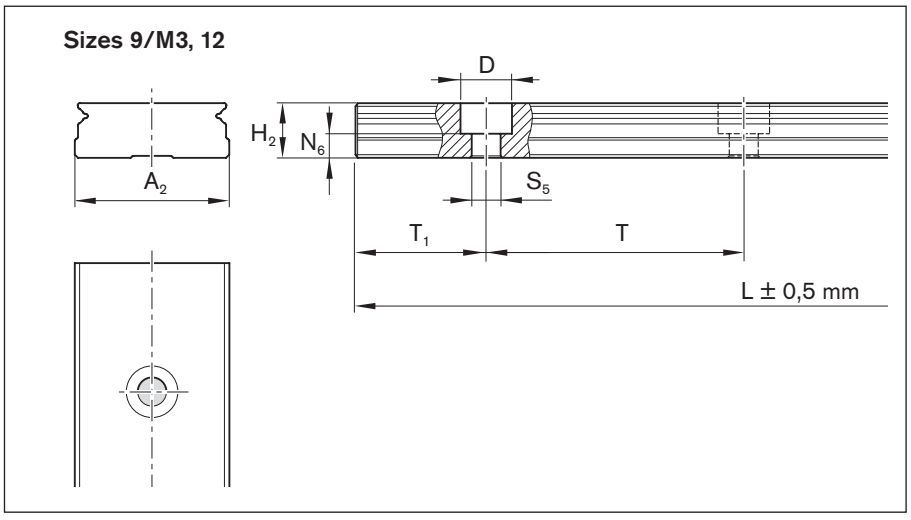
Ordering example 2
(up to L_{max} with cover strip):
Guide rail size 9/M3, accuracy class H, recommended rail length 926 mm
(30 · T, number of holes $n_B = 31$, T_1 at one end of guide rail = 4.5 mm)
Ordering data:
R0455 863 31, 926 mm, $T_1 = 4.5$ mm
(At the other end of the guide rail T_1 = 21.5 mm mm for production reasons)

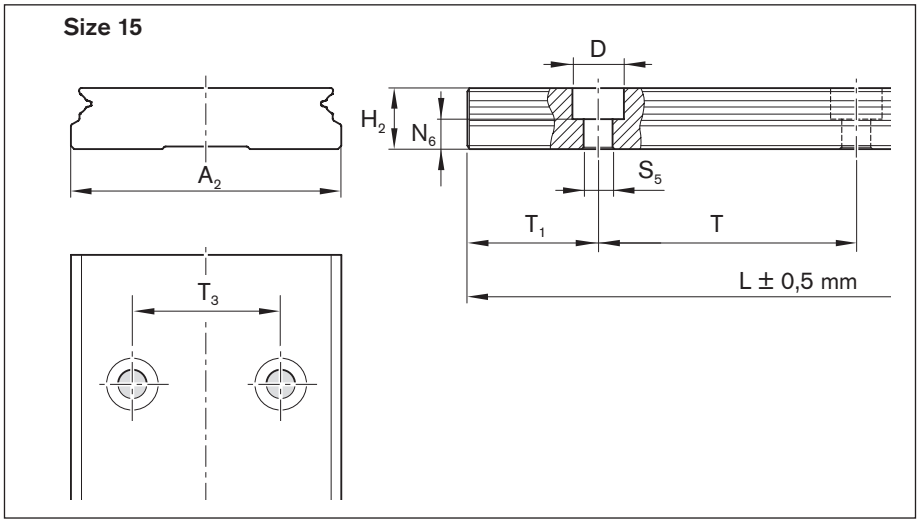
Ordering example 3
(composite rail over L_{max}):
Guide rail size 15, accuracy class N, recommended rail length 1436 mm, **2** sections (35· T, number of holes $n_B = 36$ per row, T_1 is identical at both ends of the composite guide rail)
Ordering data: **R0455 504 32, 1436 mm**

Number of sections

Ordering example 4
(one-piece over L_{max}):
Guide rail size 12, accuracy class P, recommended rail length 1636 mm
(40 · T, number of holes $n_B = 41$, T_1 is identical at both ends of the guide rail)
Ordering data: **R0455 202 31, 1636 mm**

Dimensions and weights





Size	Dimensions (mm)										Weight
	A_2	H_2[1)]	N_6	D	S_5	T_{1min}	T_{1max}	T	T_3	L_{1max}[2)3)]	(g/100 mm)
9/M3	18	7.5	2.7	6.0	3.5	6.0	25.5	30	–	1000	92
12	24	8.5	3.7	8.0	4.5	6.0	34.5	40	–	1000	145
15	42	9.5	4.7	8.0	4.5	6.0	34.5	40	23	2000	286

1) Dimensions without cover strip
2) For rail lengths longer than L_{max} factory-made mating sections are joined end-to-end.
3) For special cases one-piece guide rails up to 2000 mm length possible (please ask).

Note on adjacent structures

Permissible mounting hole tolerances for adjacent structures with one-piece guide rails.

Size	Hole position tolerance (mm)
9/M3 - 15	Ø 0.2

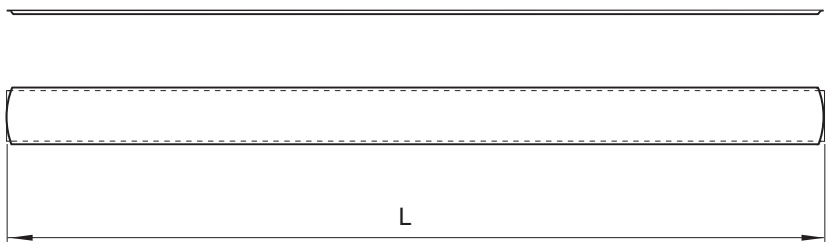
Accessories

Loose cover strip

For initial installation, storage and replacement

Note
A suitable cover strip with snap fit or with sliding fit is available for each ball guide rail SNS/BNS.

Standard loose cover strip with snap fit



Size	Standard loose cover strip with snap fit Part number, rail length L (mm)	Weight (g/m)
9/M3	R0419 830 00, ...	9
12	R0419 230 00, ...	10
15	R0419 530 00, ...	12
20	R0419 030 00, ...	17
9/M3 wide	R0419 830 50, ...	14
12 wide	R0419 230 50, ...	20
15 wide	R0419 530 50, ...	32

Ordering example 1 (standard cover strip with snap fit)

- Ball guide rail SNS
- Size 15
- Rail length
  L = 1636 mm

Part number:
R0419 530 00, 1636 mm

Start-up and maintenance

Start-up

Initial lubrication of runner blocks is necessary before miniature ball rail systems are put into service!

Runner blocks are available:
– prelubricated with a lithium soap grease, consistency class NLGI 00, Dynalub 520
– without initial lubrication for individual grease or oil lubrication.

Initial lubrication with grease

We recommend a grease lubricant per DIN 51825, class KP00K.
A grease of this type, Dynalub 520, is available in the following versions:
– Maintenance kit with 5 ml dispensing unit, part number R0419 090 01
– 400 g cartridge for use in grease guns, part number R3416 043 00

Note:
- Grease the runner block as per table.
- Move the runner block in the direction of the lube port used to distribute the grease evenly.
- Make sure there is a visible film of grease on the guide rail.

Initial lubrication with oil

We recommend the use of oils meeting the minimum requirements for CLP lubricant oils (DIN 51517, Part 3) or HLP hydraulic oils (DIN 51524, Part 2). The oil must have a viscosity of 100 mm^2/s at 40 °C.

- Follow the manufacturer's instructions.
- It is essential to check that the lubricant will reach all rolling elements in the installed condition (orientation).
- Apply oil until excess emerges.

⚠ **Add the entire oil quantity in one go!**

Maintenance

The maintenance intervals depend on the application and the ambient conditions.

Under normal conditions no in-service lubrication is required.

Cleaning

Dirt can settle and encrust on the guide rails, especially when these are not enclosed. This dirt must be removed to protect the seals.

- Always run a cleaning cycle before shutting down the machine.

In-service lubrication

Initial lubrication (long-term lubrication) is sufficient for 5,000 km travel where:
– $F < 0.1\ C$
– $v_m = 0.65$ m/s
– 90 mm stroke
– low-friction seals
- For in-service lubrication with grease or oil, follow instructions as for initial lubrication.

⚠ **The in-service lubrication intervals depend on ambient conditions, loading and type of load!**

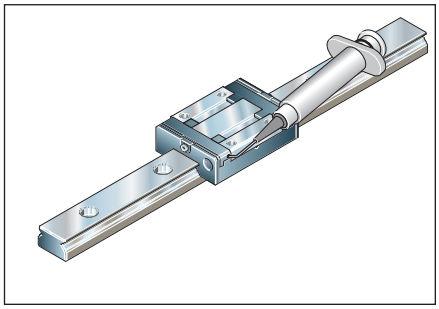
Ambient conditions include: swarf, metallic and other abrasion, solvents and temperature. Load types include vibrations, impacts and tilting.

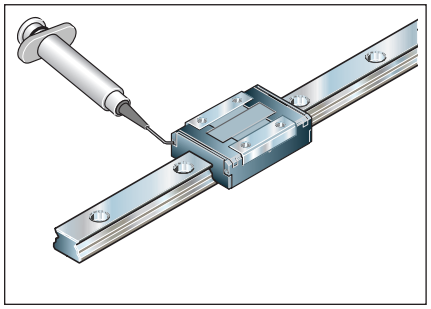
⚠ **The service conditions are unknown to the manufacturer. Users can only determine the in-service lubrication intervals with certainty by conducting in-house tests or by careful observation.**

⚠ **Do not allow guide rails or runner blocks to come into contact with water-based metalworking fluids!**

Maintenance kit

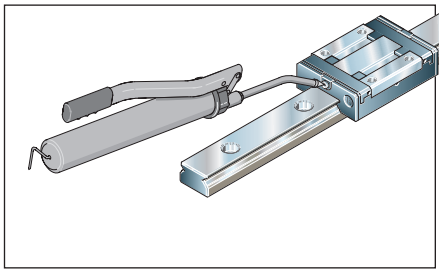
A **special syringe** is used to apply lubricant to the **lube ports** at the sides or end faces of the runner block.





Article	Part number
Syringe filled	R0419 090 01
Syringe unfilled	R0419 090 02

If the **funnel-type lube nipples** on the runner block end faces are preferred, use a **grease gun** instead.



Short stroke
(stroke < 2 runner block lengths)

See “Lubrication quantities and methods” for the method to be used for short-stroke applications.

For strokes < 0.5 runner block length, slide the runner block over 2 complete runner block lengths per lubrication cycle. If this is not possible, please consult us.

Lubrication quantities and methods

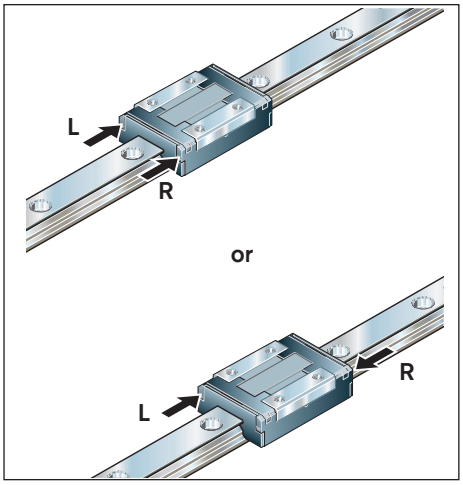
The lubrication method depends on the size, as given in the table:

Size	Lubrication by method 1	method 2
Standard runner block R0442		
7	✓	
9/M3	✓	
12	✓	
15		✓
20		✓
Long runner block R0444		
7	✓	
9/M3	✓	
12	✓	
15		✓
Wide runner block R0443; wide, long R0441		
9/M3	✓	
12	✓	
15		✓

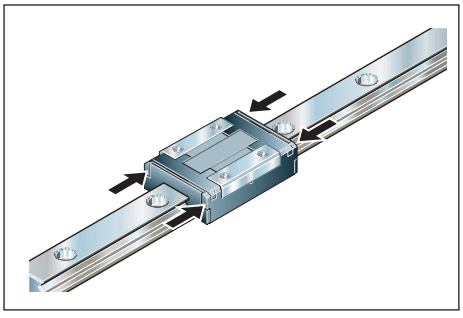
Method 1

Apply lubricant through the lube ports on the end face.

Size	Initial lubrication with grease	
	Partial amount per side (L/R)* (cm^3)	Total amount (L+R)* (cm^3)
Standard runner block R0442		
7	0.025	0.05
9/M3	0.030	0.06
12	0.075	0.15
Long runner block R0444		
7	0.04	0.08
9/M3	0.045	0.09
12	0.12	0.24
Wide runner block R0443		
9/M3	0.040	0.08
12	0.075	0.15
Wide, long runner block R0441		
9/M3	0.060	0.12
12	0.11	0.22



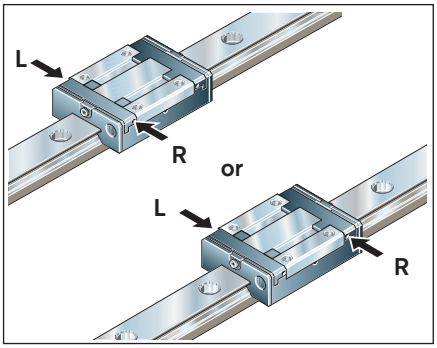
For **short stroke** applications, apply the partial amount per side as given in the table to each end-face lube port.
* (L = left, R = right)

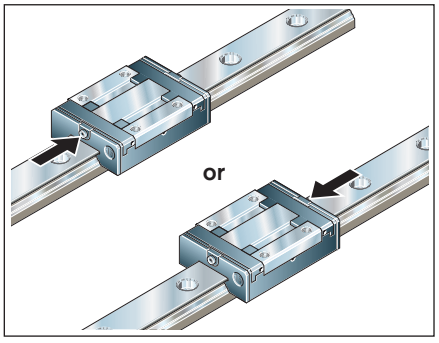


Method 2

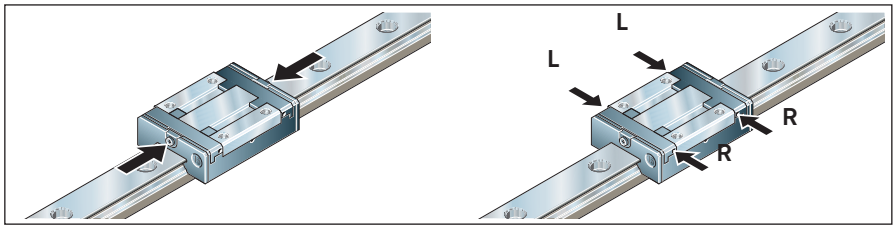
Apply lubricant through the lube ports at the sides (partial amount per side) or the lube nipple on the end face (total amount).

Size	Initial lubrication with grease	
	Partial amount per side (L/R) (cm^3)	Total amount via end face (cm^3)
Standard runner block R0442		
15	0.06	0.12
20	0.09	0.18
Long runner block R0444		
15	0.10	0.20
Wide runner block R0443		
15 B	0.09	0.18
Wide, long runner block R0441		
15	0.13	0.26





For **short-stroke** applications, apply either the total amount as per table to each end-face lube nipple, or the partial amount per side as given in the table to each side lube port.



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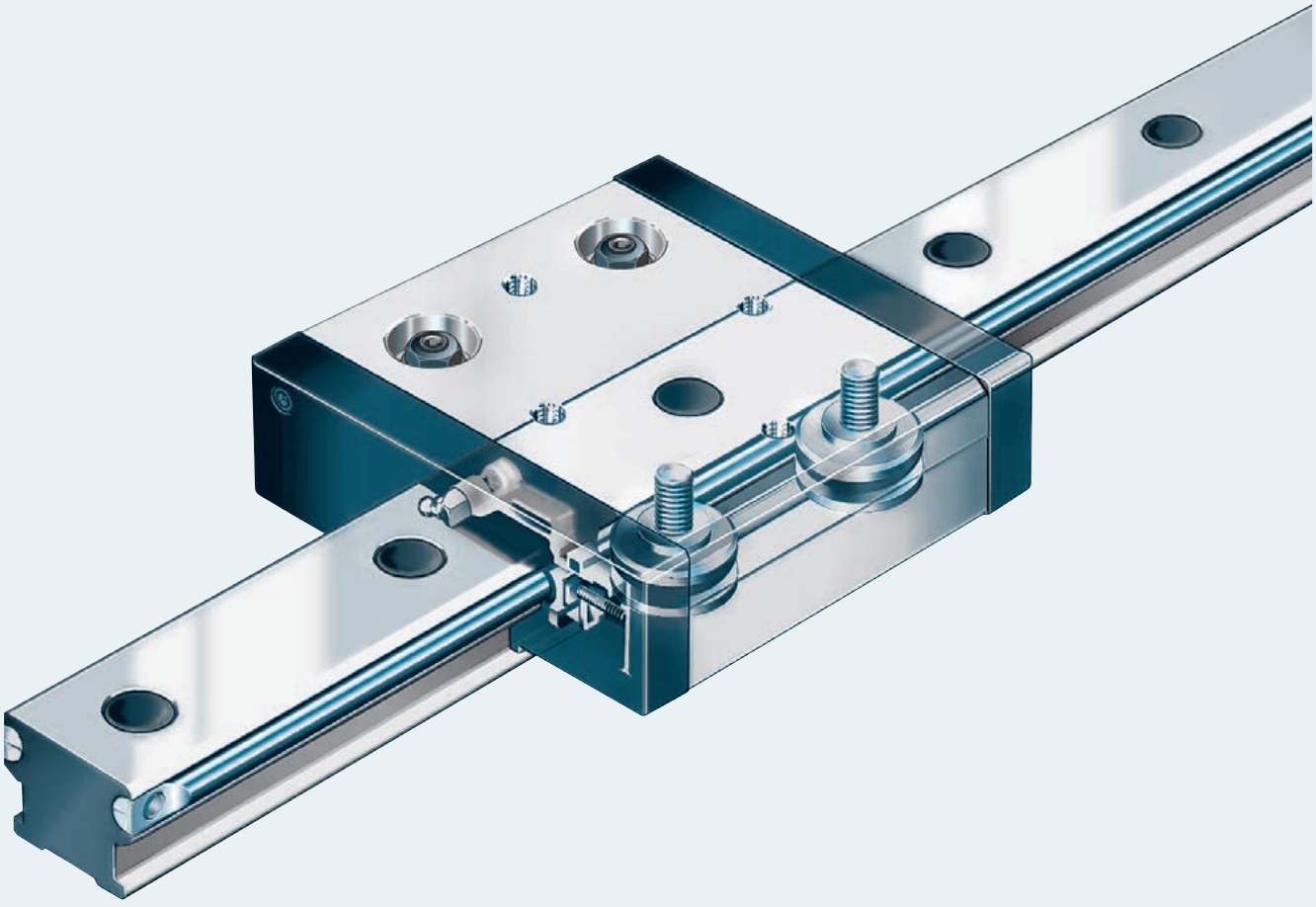
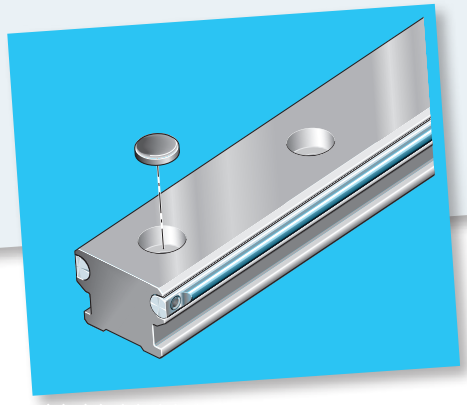
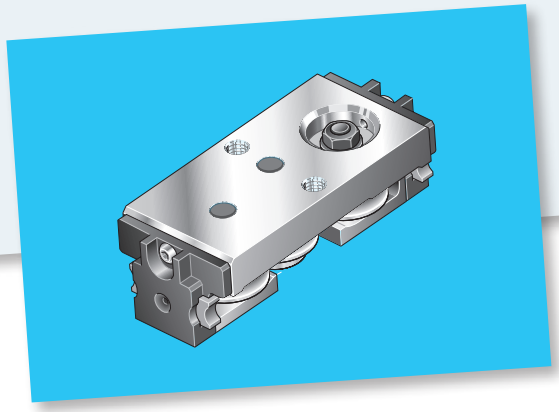
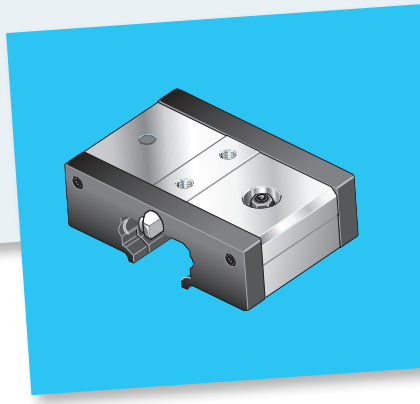
Cam Roller Guides









Cam Roller Guides

Product Overview

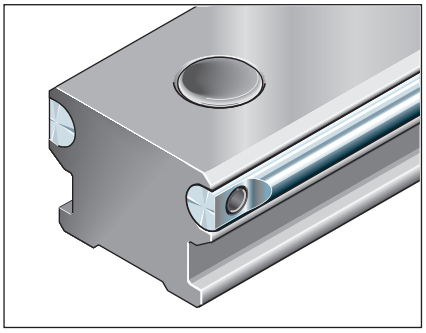
Rexroth Cam Roller Guides have been specially developed for use in handling and automation applications.

Features:
- High permissible speeds
- Compact design
- Light weight
- Easy mounting
- Low friction and extremely low-noise operation
- Complete guideway systems
- Interchangeability
- Elements can be individually ordered and separately stocked

Standard Runner blocks
- High load capacity in all planes of load application. High moment capacity about all axes
- Oil applicator/wiper unit with large oil reservoir at both ends
- Lube nipple port at either end
- The runner block can be simply adjusted to zero clearance by means of eccentric pins
- 2-row angular contact thrust ball bearing, sealed and lubricated for life

Profile Runner Block
- The runner block is adjusted to zero clearance before leaving the factory
- Wiper and lubrication units are available as accessories

Standard guide rail
- Guide shaft support made of anodized aluminum
- Optional mounting hole plugs
- Secured guide tracks made of corrosion-resistant precision steel shafts

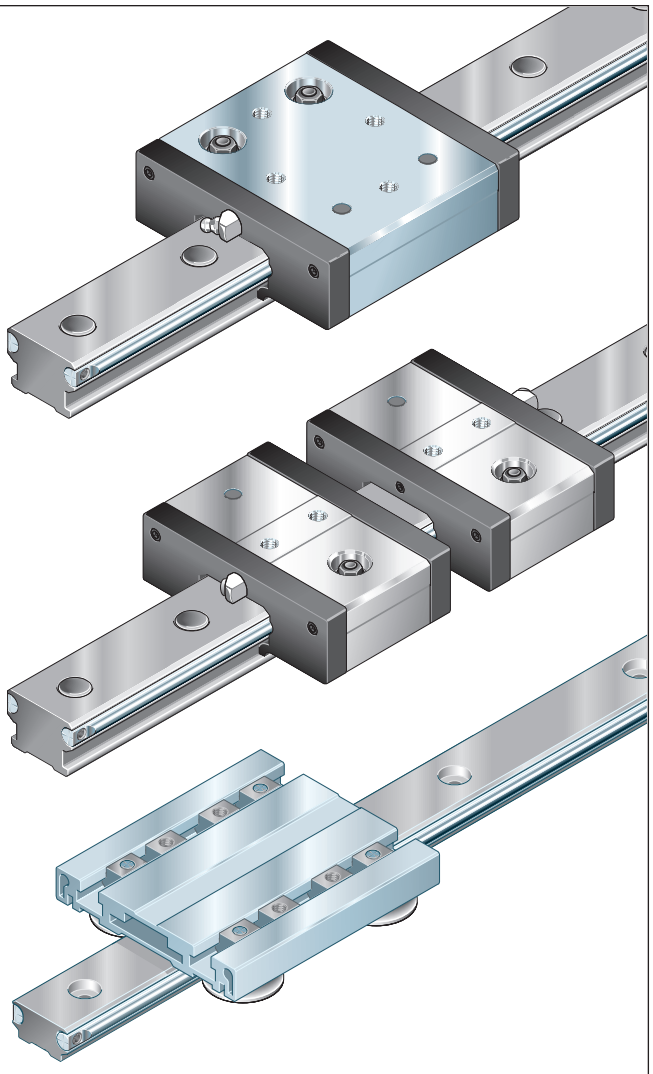


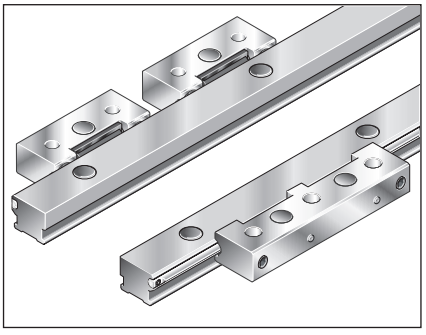
Standard guide rail
Secured guide tracks made of corrosion-resistant precision steel shafts

Standard Runner Blocks

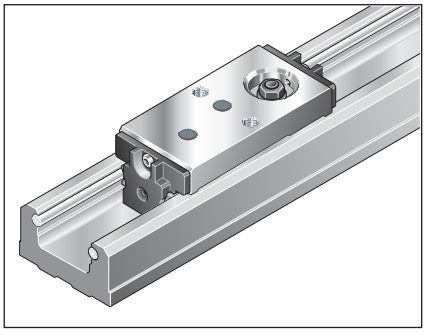
Super Runner Blocks

Profile Runner Block

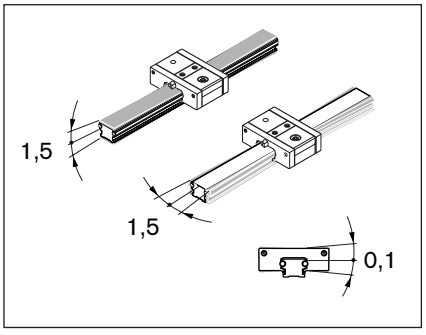




Single Bearing Runner Blocks, Double Bearing Runner Blocks
On two half-rails



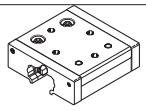
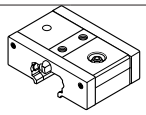
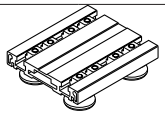
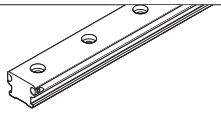
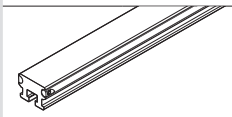
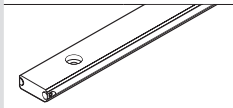
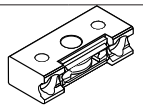
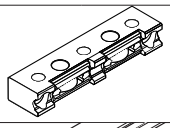
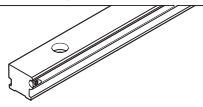
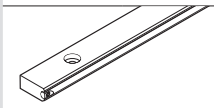
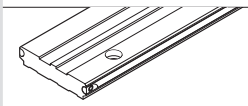
U-type Cam Roller Guides



Super Runner Blocks
For uneven mounting surfaces or other alignment errors:

Product Overview

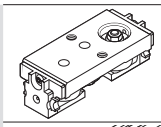
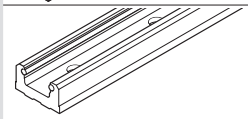
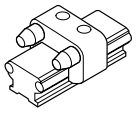
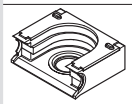
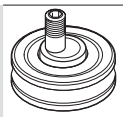
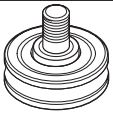
Combination options

			Page	20 Part number / Size - Version
Standard Runner Block			24	1902-119-00
Super Runner Block			26	1906-119-00
Profile Runner Block			28	
Guide Rails		Standard	30	1921-119-31
		With T-Slot	32	
		Low-Profile	34	
Single Bearing Runner Block			36	
Double Bearing Runner Block			38	
Guide Rails for Single Double Bearing Runner Blocks		Standard half-rail	40	
		Low-Profile half-rail	42	
		Wide	44	

	Size					
	25	32		42	52	
	1902-125-00	1902-132-00			1902-152-00	1902-252-00 52-h (high loads)	1902-352-00 52-sh (extreme loads)
	1906-125-00						
				1907-142-00			
	1921-125-31	1921-132-31	1921-232-31 32-2 (twice as many mounting holes)	1921-142-31	1921-152-31	1921-252-31 52-2 (twice as many mounting holes)	1921-452-31 52-4 (four times as many mounting holes)
	1922-025-31	1922-032-31					
		1924-132-31	1924-323-31 32-2 (twice as many mounting holes)		1924-152-31	1924-252-31 52-2 (twice as many mounting holes)	1924-452-31 52-4 (four times as many mounting holes)
		1903-132-10			1903-152-10	1903-252-10 52-h (high load)	1903-352-10 52-sh (extreme loads)
		1904-132-10			1904-152-31	1904-252-10 52-h (high load)	1904-352-10 52-sh (extreme loads)
		1925-132-31	1925-232-31 32-2 (twice as many mounting holes)		1925-152-31	1925-252-31 52-2 (twice as many mounting holes)	1925-452-31 52-4 (four times as many mounting holes)
		1926-132-31	1926-232-31 32-2 (twice as many mounting holes)		1926-152-31	1926-252-31 52-2 (twice as many mounting holes)	1926-252-31 52-4 (four times as many mounting holes)
						1927-152-31	

Product Overview

Combination options

			Page	20 Part number / Size - Version	
U-type Cam Roller Guides		U-type Runner Block	46	1905-119-00	
		U-type Guide Rail	48	1923-119-31	
Accessories		Dead stop	50		
		Lubrication unit for profile runner blocks	51		
Modules Cam Rollers with Eccentric Spigot			52	R1900 119 00	
Modules Cam Rollers with Central Spigot			54	R1900 119 01	

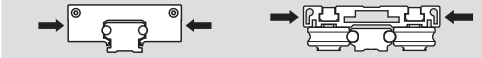
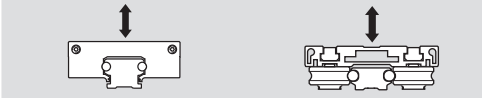
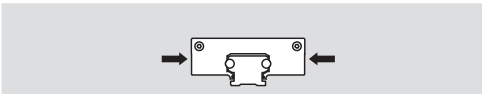
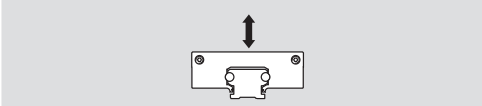
	Size					
	25	32	42	52		
		1910-532-00		1910-552-00		
			R1910 442 00			
	R1900 125 00	R1900 132 00		R1900 152 00	R1900 152 10 52-h	R1900 152 20 52-sh
	R1900 125 01	R1900 132 01		R1900 152 01	R1900 152 11 52-h	R1900 152 21 52-sh

Product Overview

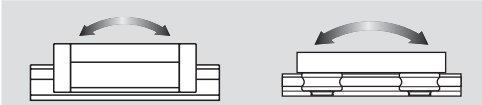
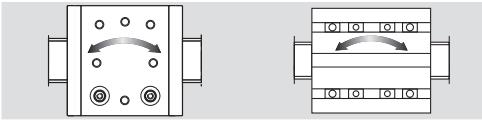
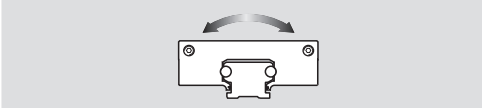
Maximum Permissible Loads

Important: Not to be used for calculating service life!
For service life calculations use the load capacities and moments given in the tables relating to the individual versions.

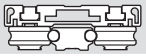
Maximum permissible force loads

			20	
Standard Runner Block 1902-, 1907-		$F_{max\ y}$ (N)*	700	
		$F_{max\ y0}$ (N)*	700	
		$F_{max\ z}$ (N)	400	
		$F_{max\ z0}$ (N)	600	
Super Runner Block RH1906		$F_{max\ y}$ (N)*	350	
		$F_{max\ y0}$ (N)*	350	
		$F_{max\ z}$ (N)	200	
		$F_{max\ z0}$ (N)	300	

Maximum permissible moment loads

Standard Runner Block R1902-, R1907-		$M_{max\ x}$ (Nm)	3,2	
		$M_{max\ x0}$ (Nm)	4,8	
		$M_{max\ y}$ (Nm)	6,8	
		$M_{max\ y0}$ (Nm)	10,2	
		$M_{max\ z}$ (Nm)	12	
		$M_{max\ z0}$ (Nm)	12	
Runner Block RH1906		$M_{max\ x}$ (Nm)	1,6	
		$M_{max\ x0}$ (Nm)	2,4	

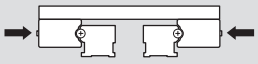
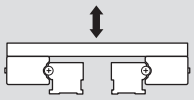
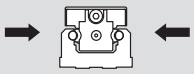
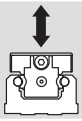
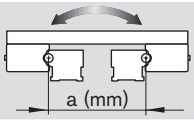
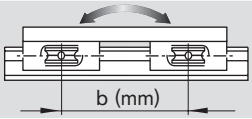
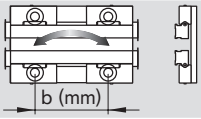
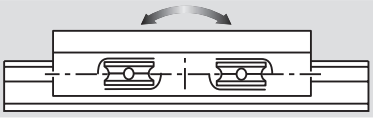
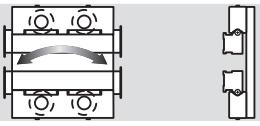
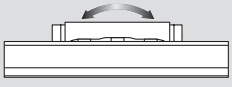
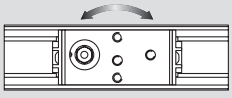
* Observe permissible side force on the rail (see Mounting Instructions).

	Size - Version							
	25	**32**	**32** **32-2**	**42** 	**52**	**52** **52-2**	**52-h** **52-2**	**52-sh** **52-4**
	700	1000	1400	3000	2500	3500	4500	8000
	700	1000	1400	3000	2500	3500	4500	8000
	400	850	850	1500	1500	1500	2400	4800
	660	1400	1400	2500	2500	2500	4000	7900
	350							
	350							
	200							
	330							
	3,8	11	11	27	32	32	50	101
	6	18	18	42	52	52	84	166
	9	26	26	63	45	45	126	288
	15	42	42	106	75	75	210	474
	16	30	42	127	75	105	236	480
	16	30	42	127	75	105	236	480
	1,9							
	3							

Product Overview

Maximum Permissible Loads

Important: Not to be used for calculating service life!
For service life calculations use the load capacities and moments given in the tables relating to the individual versions.

					20	
Maximum permissible force loads						
Four Single/Two Double Bearing Runner Blocks		$F_{max\ y}$	(N)			
		$F_{max\ y0}$	(N)			
		$F_{max\ z}$	(N)			
		$F_{max\ z0}$	(N)			
U-type Runner Block		$F_{max\ y}$	(N)		350	
		$F_{max\ y0}$	(N)		350	
		$F_{max\ z}$	(N)		200	
		$F_{max\ z0}$	(N)		300	
Maximum permissible moment loads						
Four Single/Two Double Bearing Runner Blocks		$M_{max\ x}$	(Nm)			
		$M_{max\ x0}$	(Nm)			
Four Single Bearing Runner Blocks		$M_{max\ y}$	(Nm)			
		$M_{max\ y0}$	(Nm)			
		$M_{max\ z}$	(Nm)			
		$M_{max\ z0}$	(Nm)			
Two Double Bearing Runner Blocks		$M_{max\ y}$	(Nm)			
		$M_{max\ y0}$	(Nm)			
		$M_{max\ z}$	(Nm)			
		$M_{max\ z0}$	(Nm)			
U-type Runner Block		$M_{max\ x}$	(Nm)		1,4	
		$M_{max\ x0}$	(Nm)		2,2	
		$M_{max\ y}$	(Nm)		3,4	
		$M_{max\ y0}$	(Nm)		5,1	
		$M_{max\ z}$	(Nm)		6,1	
		$M_{max\ z0}$	(Nm)		6,1	

	Size - Version						
	25	**32**	**32** **32-2**	**52**	**52** **52-2**	**52-h** **52-2**	**52-sh** **52-4**
		1000	1400	2500	3500	4500	8000
		1000	1400	2500	3500	4500	8000
		850	850	1500	1500	2400	4800
		1400	1400	2500	2500	4000	7900
		0,42 · a	0,42 · a	0,75· a	0,75 · a	1,2 · a	2,4 · a
		0,7 · a	0,7 · a	1,2 · a	1,2 · a	2 · a	3,9 · a
		0,42 · b	0,42 · b	0,75· b	0,75 · b	1,2 · b	2,4 · b
		0,7 · b	0,7 · b	1,2 · b	1,2 · b	2 · b	3,9 · b
		0,5 · b	0,7 · b	1,2 · b	1,7 · b	2,2 · b	4 · b
		0,5 · b	0,7 · b	1,2 · b	1,7 · b	2,2 · b	4 · b
		21	21	49	49	91	194
		35	35	83	83	152	320
		25	35	83	116	171	324
		25	35	83	116	171	324

Technical Data

Maximum travel speed
at medium loads

$v_{max} = 10$ m/s

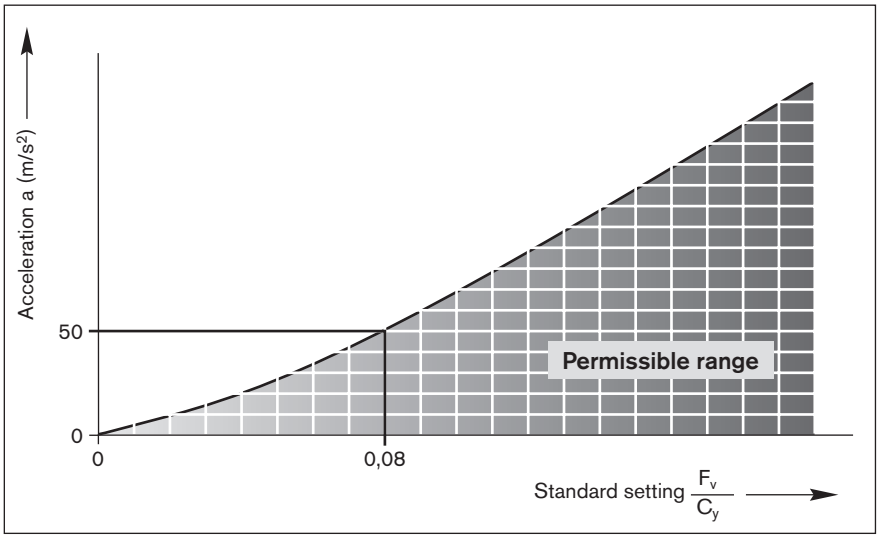
Permissible operating temperature

t = –20 °C up to + 80 °C

Acceleration
Higher acceleration rates are permissible as long as slip is avoided.
To do this, adjust preload F_v using the eccentric rollers, see chart.

⚠ **Increasing the preload will reduce the maximum permissible load.**

$a_{max} = 50$ m/s²

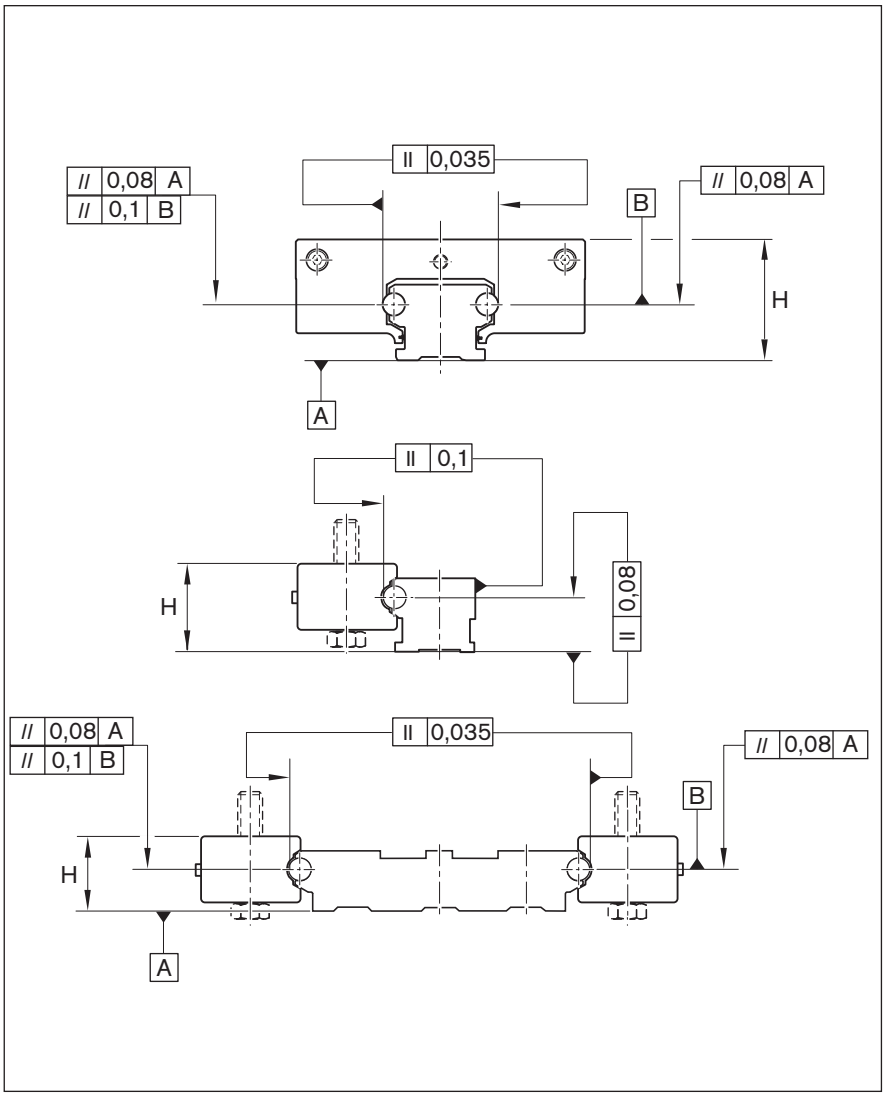


Rigidity
The rigidity can be improved by increasing the preload using the eccentric rollers.

Accuracy

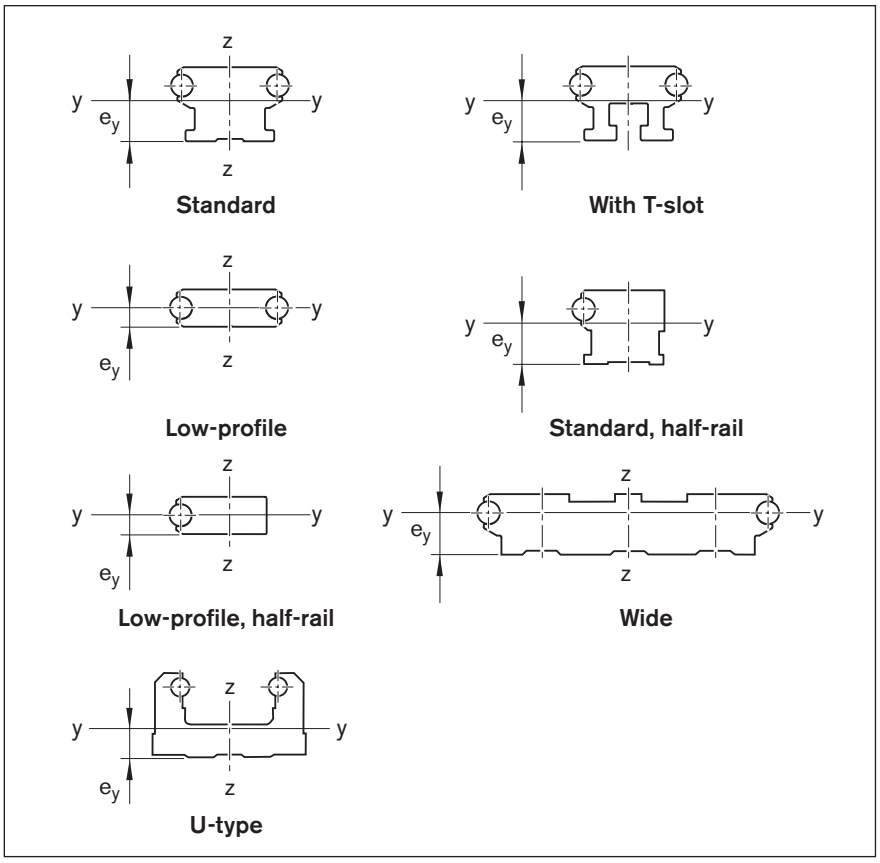
Rexroth Guide Rails are manufactured to very high precision standards.
Higher accuracies are available on request.
Tolerance for H: ± 0.2 mm

Maximum difference in H
on the same guide rail: 0.1 mm



Technical Data

Sectional characteristics of guide rails



e_y : Centroid distance
$I_{y,z}$: Second moment of inertia
$W_{y,z}$: Section modulus

	Size	Cross-sectional area	Neutral axis				
					y-y		z-z
		A	e_y	I_y	W_y	I_z	W_z
		(mm^2)	(mm)	(mm^4)	(mm^3)	(mm^4)	(mm^3)
Standard	**20**	168	6,0	2060	343	3090	364
	25	244	7,4	4738	623	6432	613
	32	435	10,4	14551	1399	19272	1357
	42	685	11,4	19628	1722	78534	4363
	52	1222	17,6	117945	6701	148971	6477
With T-slot	**25**	194	8,1	4155	513	6191	590
	32	355	11,4	12295	1079	18666	1315
	52	913	17,6	82725	4596	140984	6130
Low-profile	**32**	234	5,0	2163	433	11412	804
	52	690	9,0	20750	2306	91104	3961
Standard, half-rail	**32**	397	10,5	13182	1255	14724	1115
	52	1116	17,7	105926	5985	111856	5251
Low-profile, half-rail	**32**	217	5,0	1913	383	8841	665
	52	633	9,0	18142	2016	68209	3202
Wide	**52**	2492	12,4	119636	2099	2378777	41733
U-type	**20**	360	7,0	8604	782	42000	2545

Life Expectancy and Static Load Safety Factor

Life Expectancy
of one Cam Roller

The nominal service life expectancy L in meters or L_h in hours is attained or exceeded by at least 90% of a large number of identical rollers.

when subject to force loads

If the Cam Roller Guide is subject to a centrally-acting force F_y or F_z, calculate the nominal travel life using formulas (1) and (2):

The force F must not exceed the maximum permissible force given in the "Maximum Permissible Loads" tables.

$$(1)\quad L = \left(\frac{C_{y,z}}{F}\right)^3 \cdot 10^5$$

$$(2)\quad L_h = \frac{L}{2 \cdot s \cdot n \cdot 60}$$

L	=	nominal life expectancy	(m)
L_h	=	nominal life expectancy	(h)
$C_{y,z}$	=	dynamic load capacity	(N)
F	=	equivalent dynamic load	(N)
s	=	length of stroke	(m)
n	=	stroke repetition rate (complete cycles)	(min^{-1})

when subject to moment loads

If the Cam Roller Guide is subject to a moment M acting about the x, y or z axis only, calculate the nominal travel life using formulas (3) and (4):

The moment M must not exceed the maximum permissible moment load given in the "Maximum Permissible Loads" tables.

$$(3)\quad L = \left(\frac{M_{x,y,z}}{M}\right)^3 \cdot 10^5$$

$$(4)\quad L_h = \frac{L}{2 \cdot s \cdot n \cdot 60}$$

L	=	nominal life expectancy	(m)
L_h	=	nominal life expectancy	(h)
$M_{x,y,z}$	=	dynamic moment	(Nm)
M	=	equivalent dynamic moment load	(Nm)
s	=	length of stroke	(m)
n	=	stroke repetition rate (complete cycles)	(min^{-1})

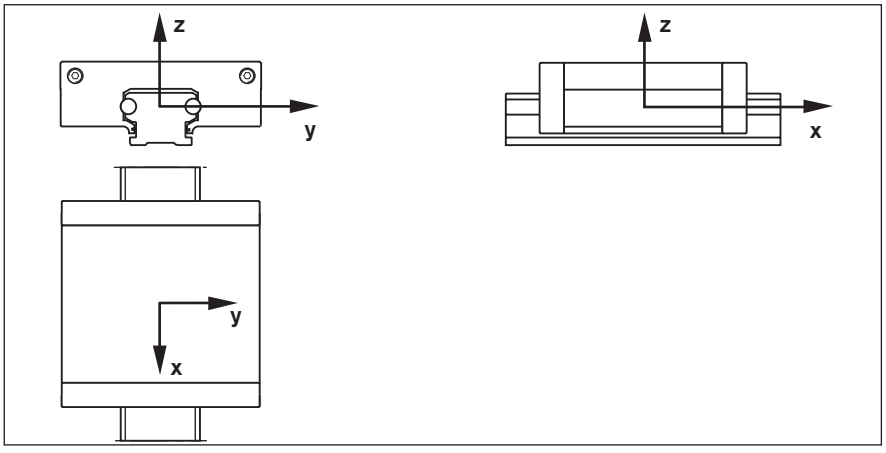
Note

The above formulas for calculation of life expectancy apply only in applications subject to a single force acting centrally in the y or z axis, or a single moment acting about the x, y or z axis.

For applications subject to a combination of forces from different directions or moments about different axes, or any combination of forces and moments, please consult us.

Coordinate system

The following coordinate system is used to define the direction of action of forces and moments:



Life Expectancy and Static Load Safety Factor

Static Load Safety Factor

when subject to force loads

If the Cam Roller Guide is subject to a centrally-acting force F_{y0} or F_{z0}, calculate the static load safety factor using formula (5):

$$(5) \quad S_0 = \frac{C_{y0,\,z0}}{F_0}$$

The force F_0 must not exceed the maximum permissible force given in the "Maximum Permissible Loads" tables.

S_0	=	static load safety factor	(-)
$C_{y0,z0}$	=	static load capacity	(N)
F_0	=	equivalent static load	(N)

when subject to moment loads

If the Cam Roller Guide is subject to a moment M_0 acting about the x, y or z axis only, calculate the static load safety factor using formula (6):

$$(6) \quad S_0 = \frac{M_{x0,\,y0,\,z0}}{M_0}$$

The moment M_0 must not exceed the maximum permissible moment load given in the "Maximum Permissible Loads" tables.

S_0	=	static load safety factor	(-)
$M_{x0,y0,z0}$	=	static moment	(Nm)
M_0	=	equivalent static moment load	(Nm)

Note

The above formulas for calculation of the static load safety factor apply only in applications subject to a single force acting centrally in the y or z axis, or a single moment acting about the x, y or z axis.

For applications subject to a combination of forces from different directions or moments about different axes, or any combination of forces and moments, please consult us.

Mounting Instructions

General Instructions

Rexroth Cam Roller Guides are high-quality products and should be treated with the utmost care during transportation and mounting.

All steel parts are coated with preservative oil. The preservative coating need not be removed provided the recommended lubricants are used in the application. Unfavorable environmental conditions (vibrations, major temperature fluctuations, etc.) can cause a relative shift between the aluminum frame and the rolled-in (or pressed-in) steel shafts of all guide rails. To prevent this phenomenon we recommend a positive-locking axial retention.

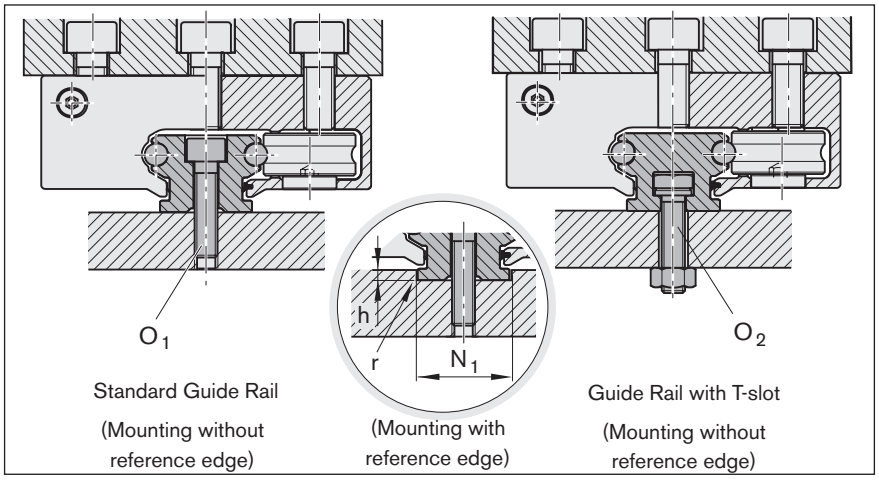
Guide Rail Mounting

To mount the guide rail:

- Slightly tighten screws.
- Align guide rail.
- Tighten screws to torque as shown in the table.

Standard Guide Rail (R1921-...):
If the maximum permissible load is to be utilized, install washers to ISO 7092.

Guide Rail with T-slot (R1922-...):
Washers are supplied with the rail.



Screw sizes for guide rails

Size - Version			20	25	32	32-2	42	52	52-2	52-4
Standard	O_1	(ISO 4762)	M4x16	M5x20	M6x25	M6x25	M8x25	M10x40	M10x40	M12x40
With T-slot	O_2	(ISO 4014) (DIN EN 2417)	–	M5	M6	–	–	M10	–	–
	N_1	min. (mm)	17,1	21,1	24,1	24,1	–	40,1	40,1	40,1
	h	max. (mm)	1,0	1,5	3,0	3,0	–	5,0	5,0	5,0
	r	max. (mm)	0,2	0,2	0,2	0,2	–	0,2	0,2	0,2

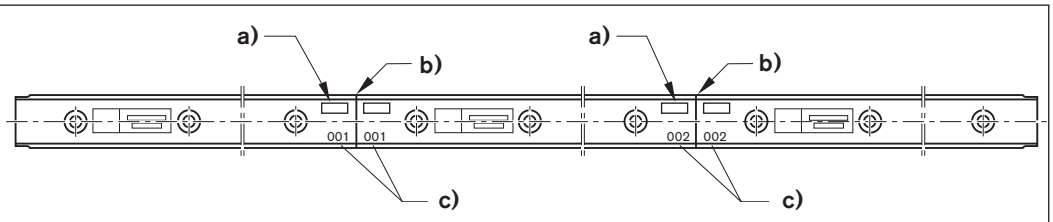
Permissible side loads

Recommended values for permissible side forces without additional lateral retention of the rail.

Size - Version	20	25	32	32-2	42	52	52-2	52-4
F_{per} (N)	200	330	450	900	1000	1000	1600	4000

Composite Guide Rails made up of several sections

a) Rail number
b) Joint
c) Joint number



Mounting Instructions

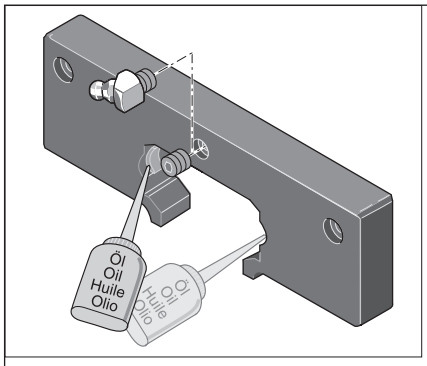
Instructions for mounting Standard and Super Runner Blocks to the Guide Rail

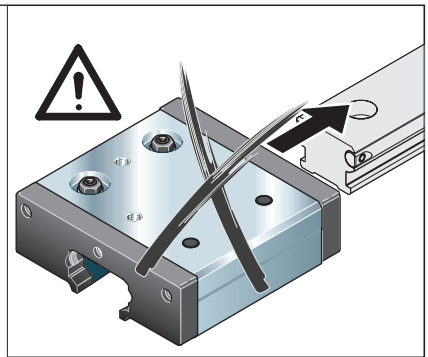
To mount the runner block:
The oil applicator and wiper units ("oiling units" for short) are delivered separate to facilitate installation work.

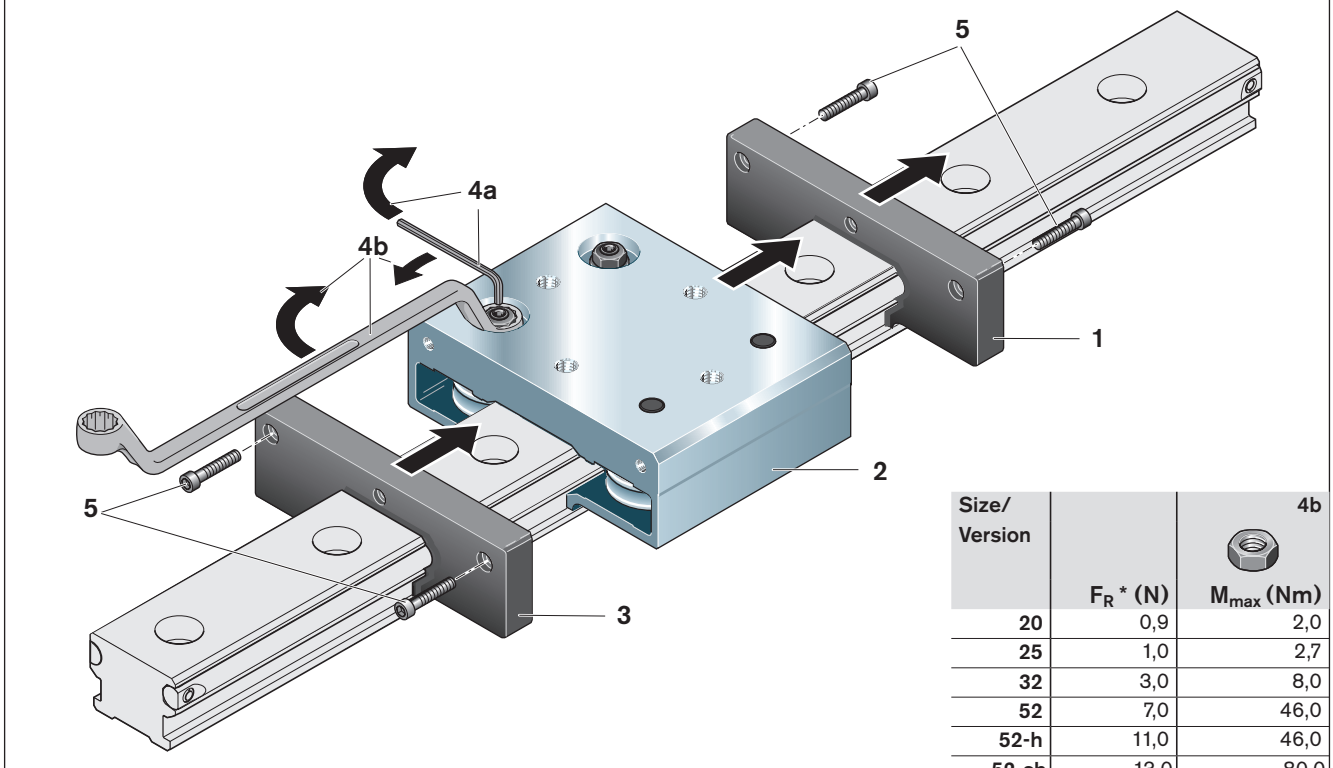
- Lubricate wiper and lubrication units with oil before sliding (for oil, see “Lubrication”)
- Push on the first oiling unit (1): The felt wiper strips are automatically pressed in by the chamfers on the steel shafts.
- Carefully slide the runner block (2) onto the guide rail.
- Adjust the eccentric rollers (4a), until a slight shifting force F_R is felt (see table for recommended values).
- Tighten the hex nut to torque as shown in the table using a hex wrench to stop the pin from turning (4b).
- Mount the second oiling unit (3).
- Screw the two oiling units to the runner block (5).

⚠ **After mounting, the runner block should move freely when pushed.**

- After installation, fill oil into the lubrication unit.







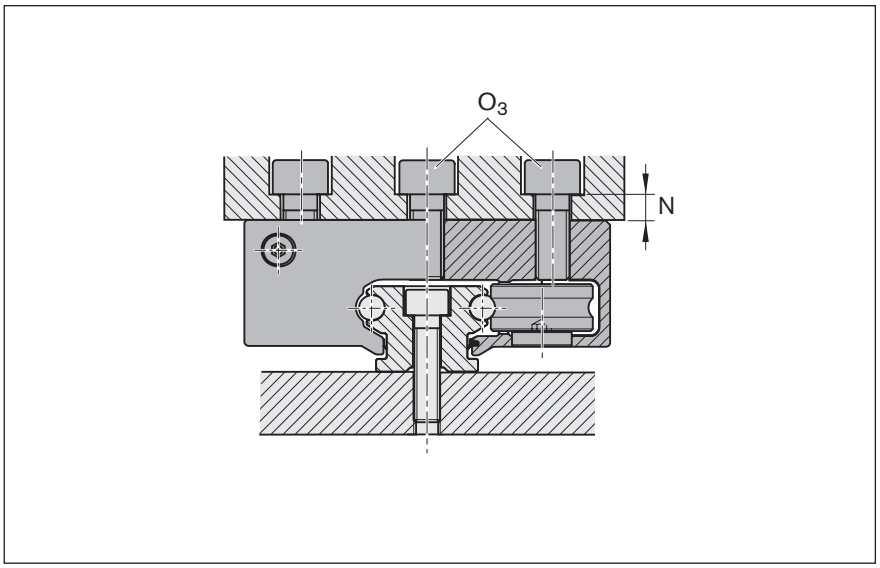
Size/ Version	F_R * (N)	4b M_{max} (Nm)
20	0,9	2,0
25	1,0	2,7
32	3,0	8,0
52	7,0	46,0
52-h	11,0	46,0
52-sh	13,0	80,0

* Computed average shifting force of the runner block for standard adjustment 0.08 C

Mounting Superstructures on Runner Blocks:

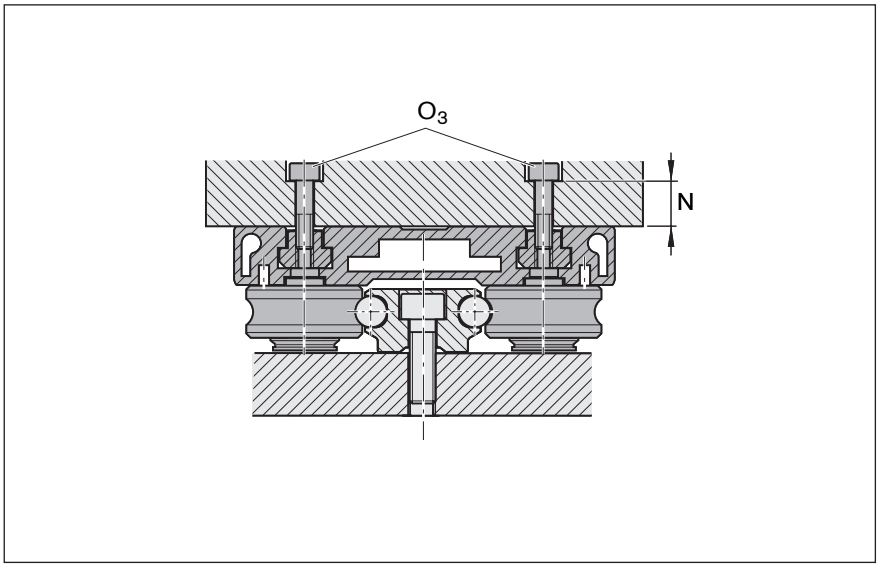
Standard Runner Block R1902, R1906

- Use screws as per table. Do not use overlong screws! Observe the minimum material strength N!
- Align the superstructure.
- Torque up the screws to the values given in the table.



Profile Runner Block R1907-

- Use screws as per table. Do not use overlong screws! Observe the minimum material strength N!
- Align the superstructure.
- Torque up the screws to the values given in the table.



Runner Blocks

Size - Version	20	25	32	32-2	42	52	52-2
O_3 (DIN ISO 4762)	M5x16	M5x16	M8x25	M8X20	M10x30	M10x35	M12x35
N (mm)	8	7	7	7	12	12	12

Tightening torques for mounting screws

	8.8	M4	M5	M6	M8	M10	M12
	(Nm)	2,7	5,5	9,5	23	46	80

Design of mounting surface

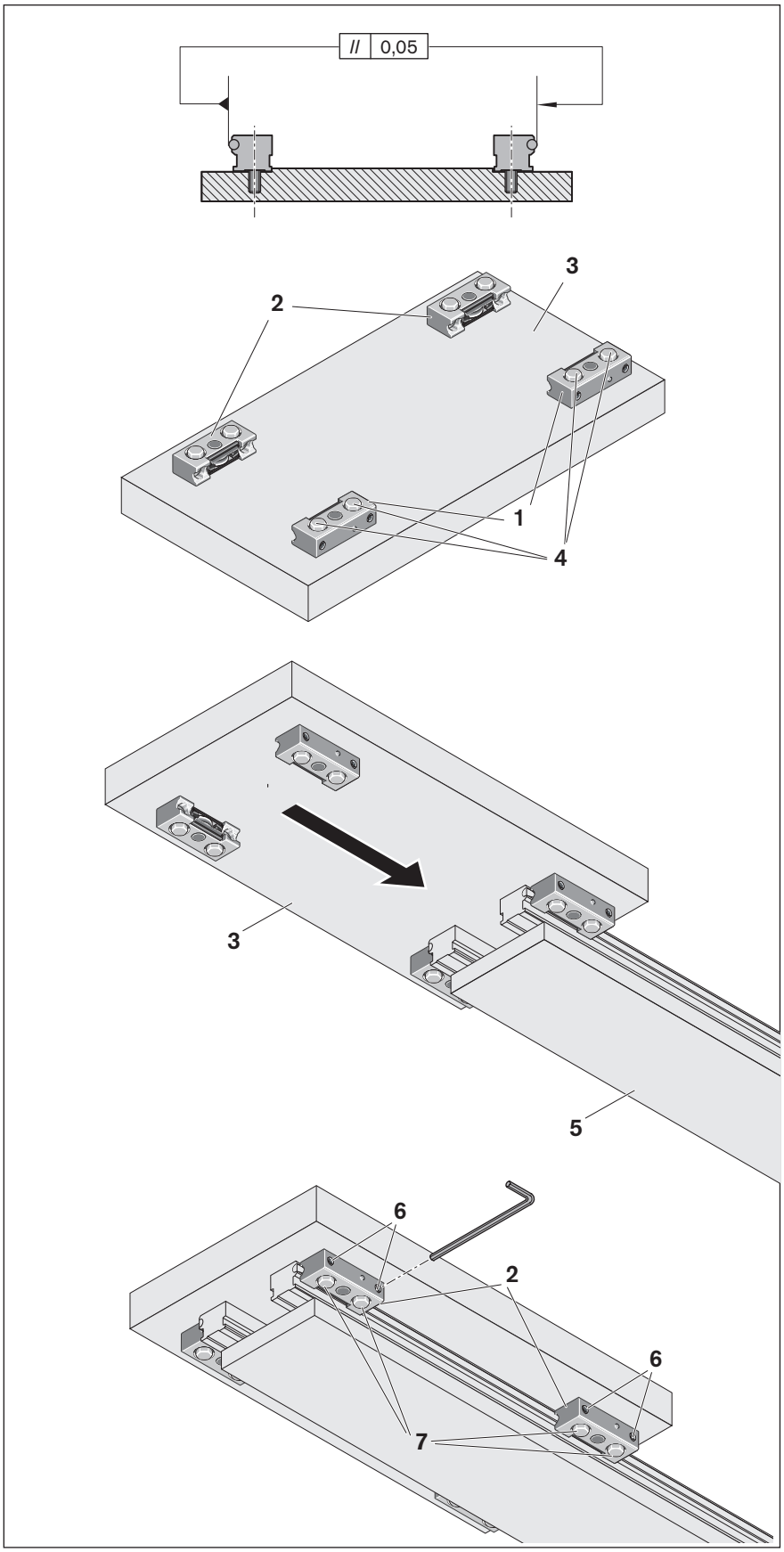
Unevenness or distortion of mounting surfaces (adjoining structures) will impair the accuracy of the guideway and should be kept to a minimum.

Mounting Instructions

Mounting Single/Double Bearing Runner Blocks with Adjustment Screws

1. Mounting

- Align and mount the rails.
- Preassemble runner blocks (1+2) on the carriage (3). Do not yet tighten the screws.
- Align the runner blocks on one side (1) of the carriage (3) and tighten the mounting screws (4) alternately until tightening torque M_A is reached.
- Slide the carriage (3) onto the rails (5).
- Adjust the runner blocks on the opposite side (2) to zero clearance against the guide rail using adjustment screws (6). Adjust the preload.
- Alternately tighten the mounting screws (7) on the runner blocks (2) until tightening torque M_A is reached.



Size -Version	32	52	52-h	52-sh
M_A (Nm)	23	46	80	80

Lubrication

Lubrication

The runner blocks have an oiling unit at each end.
Apply oil to the felt wiper strips before installing runner blocks..

The lubrication plate contains a large oil container for long relubrication intervals.

Oiling unit with large oil reservoir R1910-4..

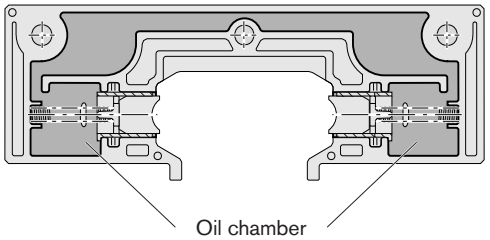
- Longer travel until in-service lubrication required: $15 \cdot 10^5$ m stroke.
- Dual function: simultaneous lubricating and wiping.
- Targeted shaft lubrication.
- Lubrication even at 90° orientation.
- For initial lubrication and relubrication, fill the oil slowly and without pressure.

Initial lubrication:

- For sizes 20 to 32, fill the entire oil volume slowly and without pressure in one stroke. For size 52, fill the oil volume in three equal partial amounts. See table for the required oil volume.

Relubrication:

- Fill oil container until oil escapes.



Size - Version	Part Number	Oilvolume Initial Filling (cm³)
20	R1910 419 00	2,5
25	R1910 425 00	3,0
32	R1910 432 00	6,5
52	R1910 452 00	18,0
52-h	R1910 452 10	20,0
52-sh	R1910 452 20	20,0

The lubrication unit is not a hermetically sealed, leak-proof tank. Minimal oil loss over time (lubrication interval) cannot be excluded, particularly for wall and overhead installations (droplet formation on welded seams/edges) and does not negatively affect its function.

For critical applications e.g. food processing, clean room applications please consult us.

Lubricant:
Oil lubrication of runner blocks (including U-type)

We recommend lubricant oils CLP, CGLP as per DIN 51517 with a viscosity of ISO VG 680 -1000 mm^2/s at 40 °C as per DIN 51519.

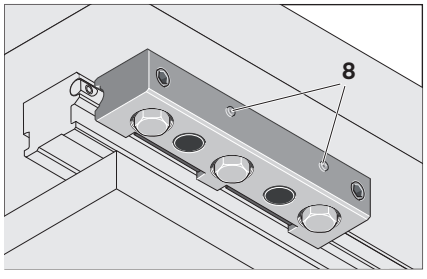
Grease lubrication of bearing runner blocks

We recommend grease lubricants to DIN 51825 - K P2 K20.
A corresponding grease Dynalub 510 is available as a 400 g cartridge.
Part number: R3416 037 00

Caution: Do not use greases containing solid lubricant particles (e.g., graphite or MoS_2).

In-service lubricating intervals will depend on the application and the ambient conditions.

- Lubricate S/D bearing runner blocks until excess grease emerges.
- For double bearing runner blocks, use both lube nipples (8)!



Minimum stroke length

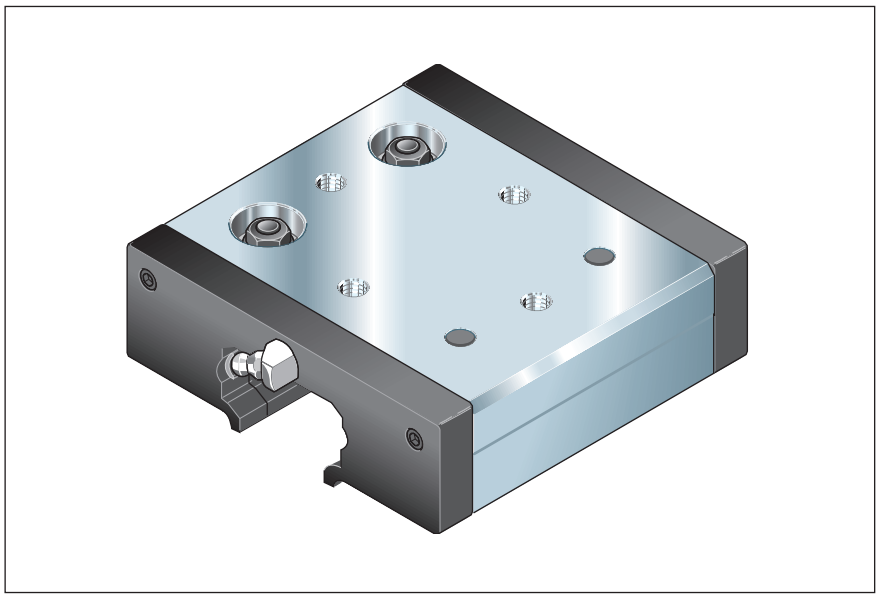
As a rule, the stroke length should not be less than the length of the runner block. For applications with shorter stroke lengths, please consult us.

Angular contact bearings

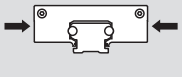
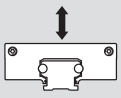
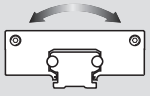
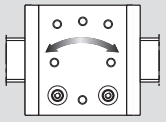
The angular contact ball bearings in the roller elements are sealed and lubricated for life.

Standard Runner Blocks

Runner Block R1902



**Part numbers,
load capacities and moments for
calculating service life**

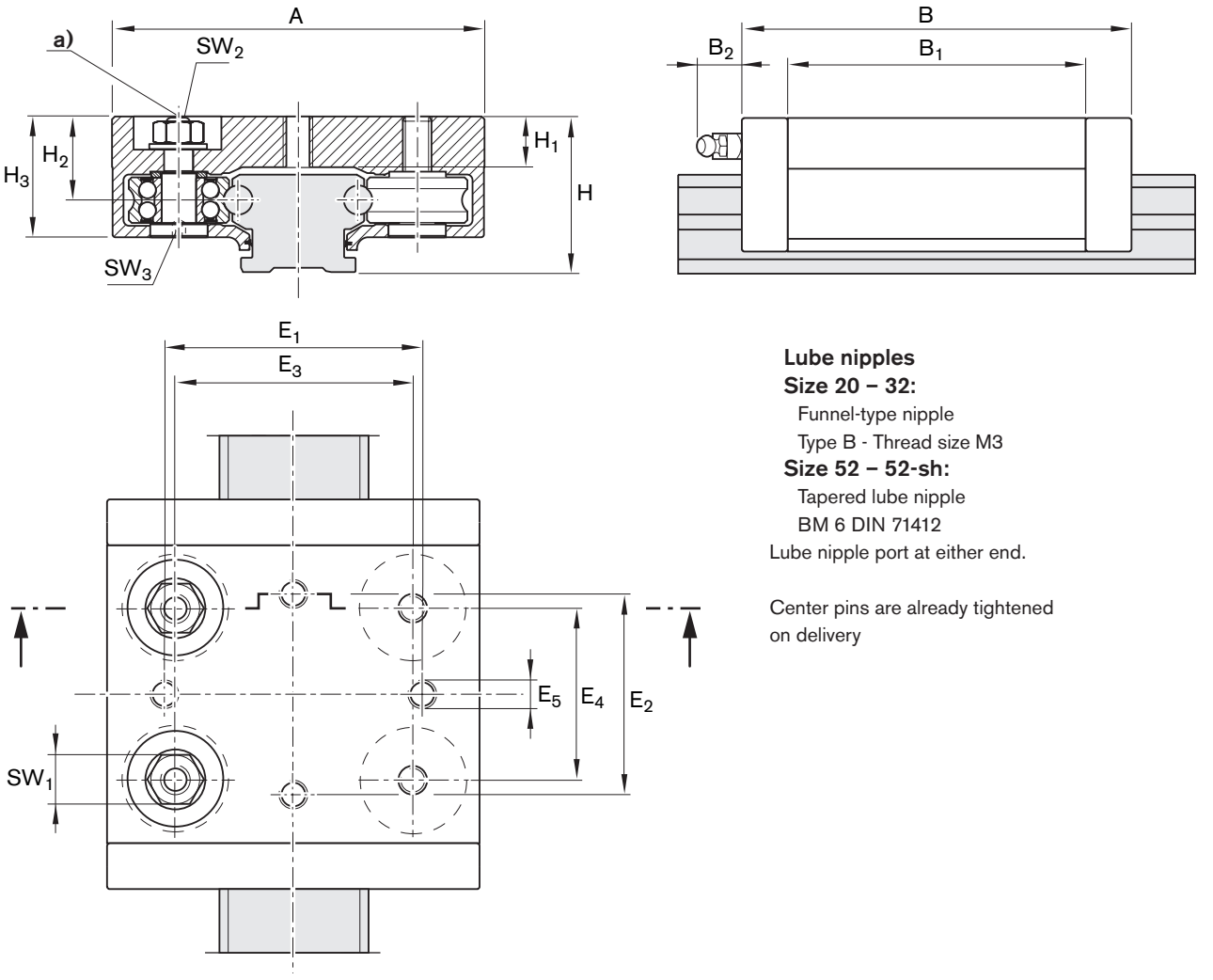
		Load capacities				Moment loads					
											
Size -Version	**Part number**	**C_y (N)**	**C_{y0} (N)**	**C_z (N)**	**C_{zo} (N)**	**M_x (Nm)**	**M_{xo} (Nm)**	**M_y (Nm)**	**M_{yo} (Nm)**	**M_z (Nm)**	**M_{zo} (Nm)**
20	R1902 119 00	2300	1600	1336	783	10,7	6,3	22,7	13,3	39	27
25	R1902 125 00	2550	1780	1357	803	13,0	7,6	30,5	18,0	57	40
32	R1902 132 00	7335	4560	4300	2200	56,0	29,0	129,0	66,0	220	137
52	R1902 152 00	17150	10200	10050	4900	211,0	103,0	301,0	147,0	515	306
52-h	R1902 252 00	27900	15400	16775	7630	352,0	160,0	880,0	400,0	1465	808
52-sh	R1902 352 00	31000	18200	18400	8750	390,0	184,0	1100,0	520,0	1860	1100

Important:

Observe maximum permissible loads due to forces and moments as shown in the "Maximum Permissible Loads" tables!

The part numbers refer to runner blocks with oiling units.
Part numbers for runner blocks without oiling units:
Size R1901 ... 00 (otherwise as shown in table)

Part numbers for oiling units without runner blocks:
Size 20-52 R1910 4.. 00 (otherwise as shown in table)
Size 52-h R1910 452 10
Size 52-sh R1910 452 20



Lube nipples
Size 20 – 32:
Funnel-type nipple
Type B - Thread size M3
Size 52 – 52-sh:
Tapered lube nipple
BM 6 DIN 71412
Lube nipple port at either end.

Center pins are already tightened on delivery

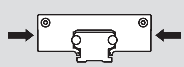
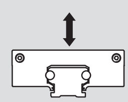
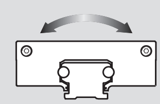
a) Adjustment of eccentric pin

Size	Dimensions (mm)																Mass
-Version	A	B	B_1	B_2	H	H_1	H_2	H_3	E_1	E_2	E_3	E_4	E_5	SW_1	SW_2	SW_3	(kg)
20	56	79	59	7	22,0	8,5	13,0	20,0	39	49	34,0	34	M5	7	2	2	0,20
25	65	95	75	7	25,0	9,0	14,4	22,3	50	60	40,0	45	M5	7	2	2	0,25
32	86	112	92	7	35,5	13,0	20,5	29,5	59	70	54,0	60	M8	10	3	4	0,56
52	130	136	104	16	54,3	19,4	29,2	42,2	90	70	83,3	60	M10	16	4	6	1,50
52-h	145	186	154	16	60,4	24,0	35,3	51,0	105	110	90,0	105	M10	16	4	6	2,60
52-sh	155	205	173	16	60,4	24,0	35,3	51,0	115	140	95,0	120	M12	18	6	8	3,30

Super Runner Blocks

Runner Block R1906

Part numbers, load capacities and moments for calculating service life

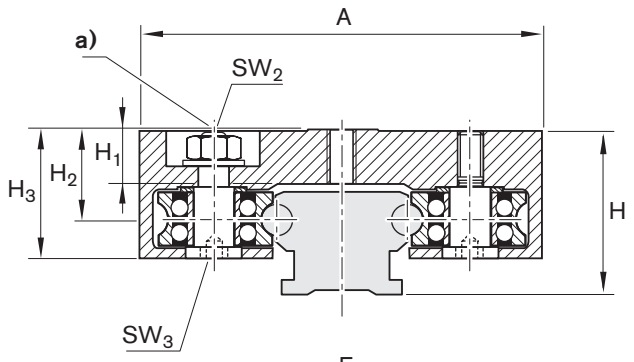
		Load capacities				Moment loads	
							
Size -Version	**Part number**	**C_y (N)**	**C_{y0} (N)**	**C_z (N)**	**C_{zo} (N)**	**M_x (Nm)**	**M_{xo} (Nm)**
20	R1906 119 00	1150	800	660	390	5,4	3,1
25	R1906 125 00	1275	890	670	400	6,5	3,8

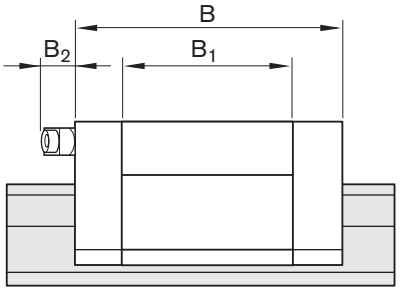
Important:

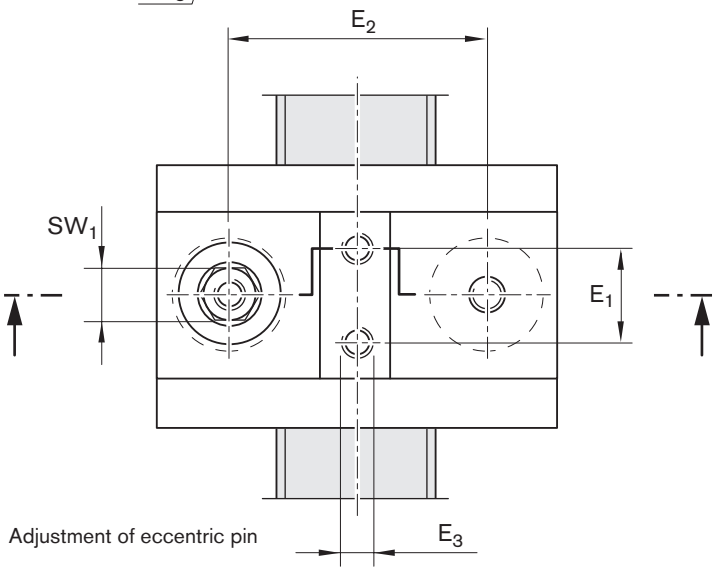
Observe maximum permissible loads due to forces and moments as shown in the "Maximum Permissible Loads" tables!

The part numbers refer to runner blocks with oiling units.
Part numbers for runner blocks without oiling units:
R1906 1.. 30 (otherwise as shown in table)

Part numbers for oiling units without runner blocks:
R1910 4.. 00 (otherwise as shown in table)







a) Adjustment of eccentric pin

Lube nipples
Funnel-type nipple
Type B - Thread size M3
Lube nipple port at either end.

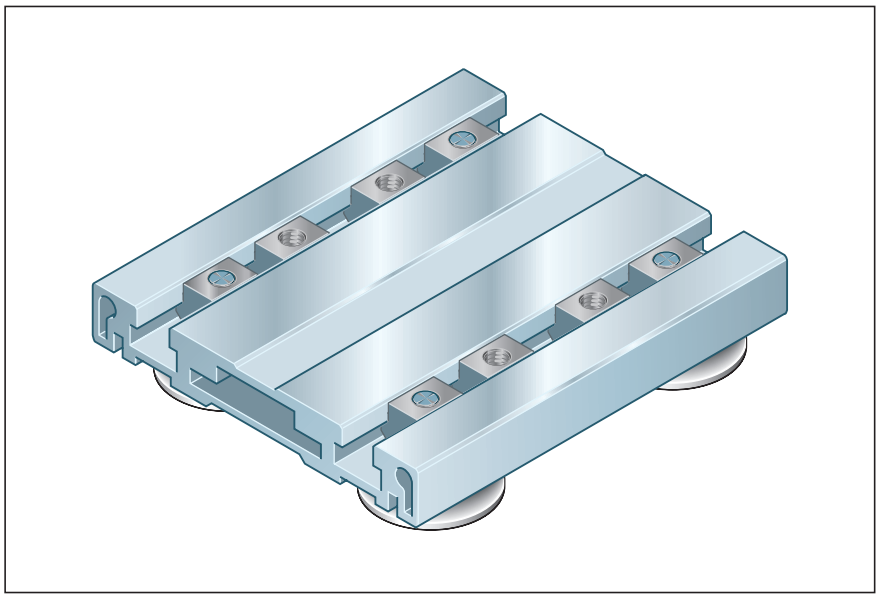
Center pins are already tightened on delivery

Size -Version	Dimensions (mm) A	B	B_1	B_2	H	H_1	H_2	H_3	E_1	E_2	E_3	SW_1	SW_2	SW_3	Mass (kg)
20	56	50	30	7	22,0	8,5	13,0	20,0	17	34	M5	7	2	2	0,10
25	65	50	30	7	25,0	9,0	14,4	22,3	20	40	M5	7	2	2	0,10

Profile Runner Blocks

Profile Runner Block R1907

Accessories:
Optionally, a separate lubrication unit is available for each cam roller of the profile runner block.
Part number: R1910 442 00
We recommend the complete lubrication with four lubrication units.
For more information, see “Accessories”.

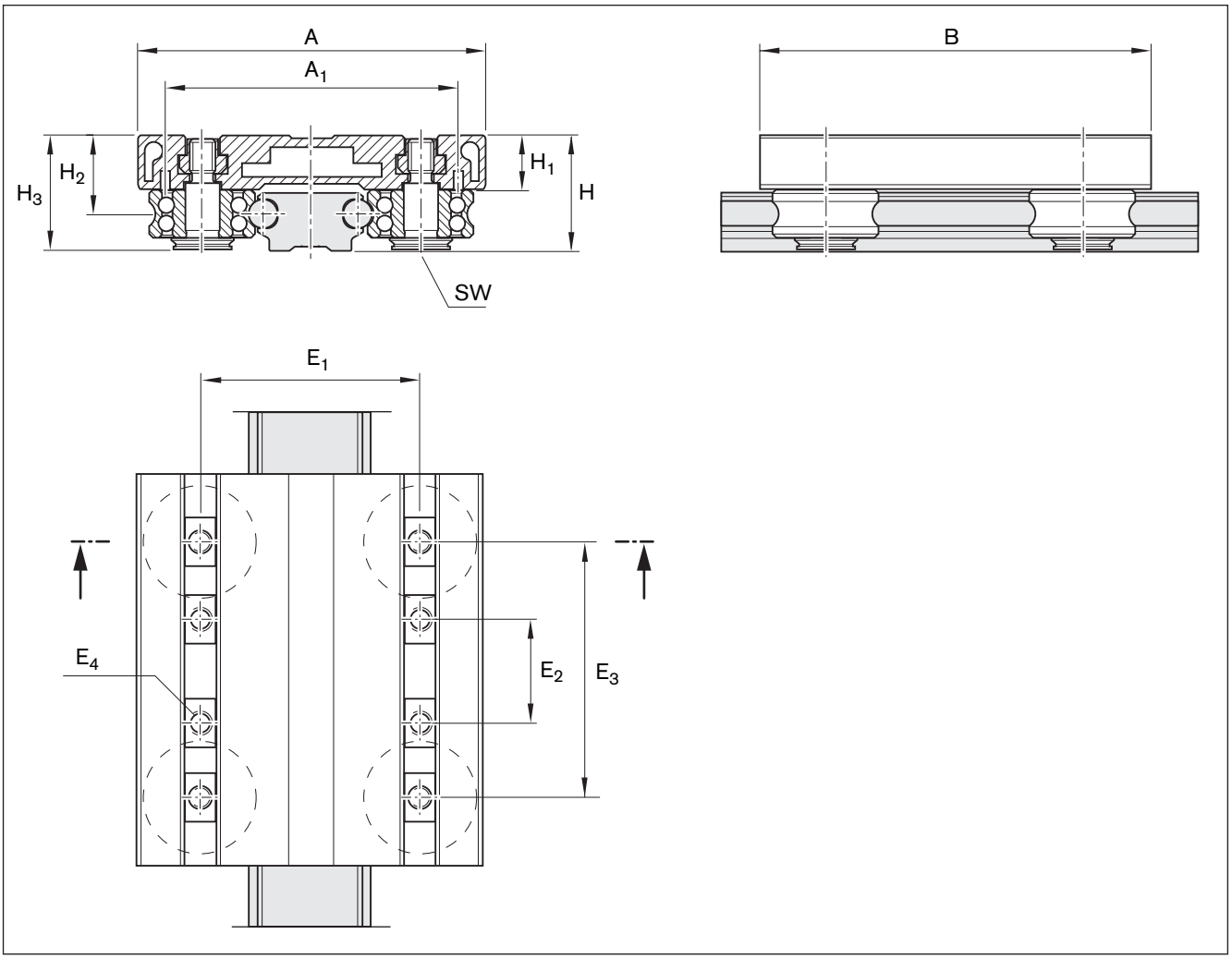


Part numbers, load capacities and moments for calculating service life

		Load capacities				Moment loads					
Size -Version	Part number	C_y (N)	C_{y0} (N)	C_z (N)	C_{zo} (N)	M_x (Nm)	M_{xo} (Nm)	M_y (Nm)	M_{yo} (Nm)	M_z (Nm)	M_{zo} (Nm)
42	R1907 142 00	17150	10200	10050	4900	162	97	430	258	729	433

Important:

Observe maximum permissible loads due to forces and moments as shown in the "Maximum Permissible Loads" tables!

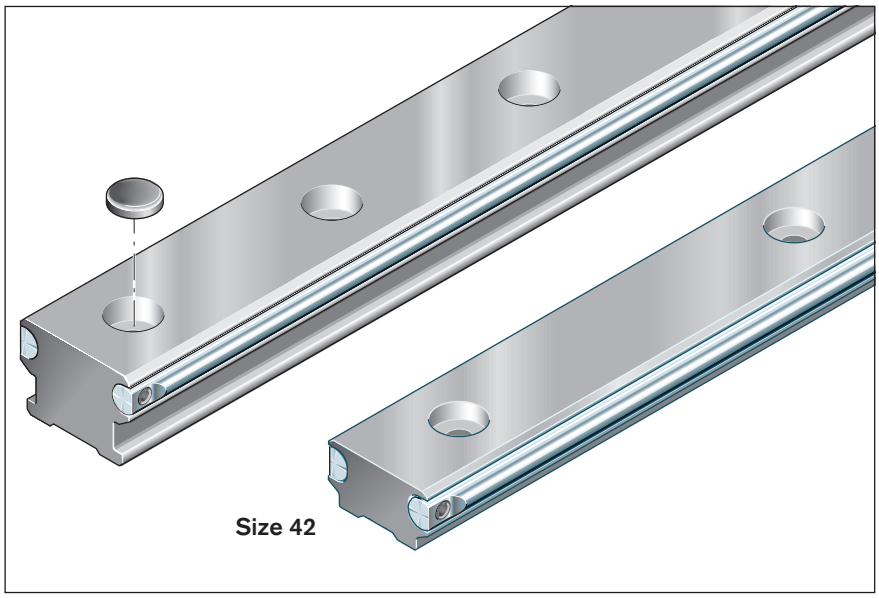


Size	Dimensions (mm)												Mass
-Version	A	A_1	B	H	H_1	H_2	H_3	E_1	E_2	E_3	E_4	SW_1	(kg)
42	116	98,5	150	39	18	26,4	38,1	73	15 - 55	85	M8	6	1,03

Guide Rails

Guide Rail standard R1921

- For mounting from above
- Optional mounting hole plugs (to be ordered separately)
- Corrosion resistant steel shafts to DIN EN ISO 683-17 / EN 10088



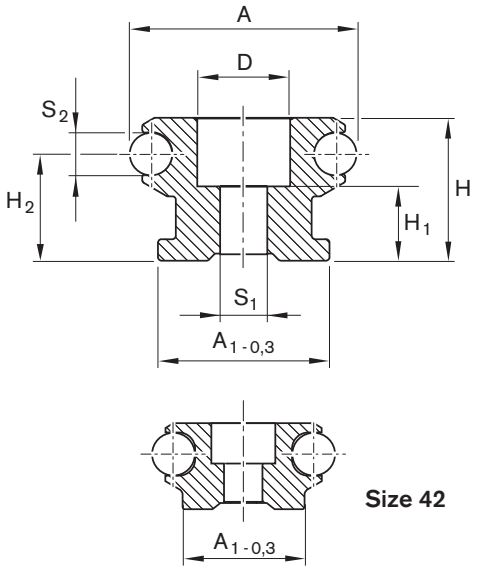
Size 42

Part numbers, lengths

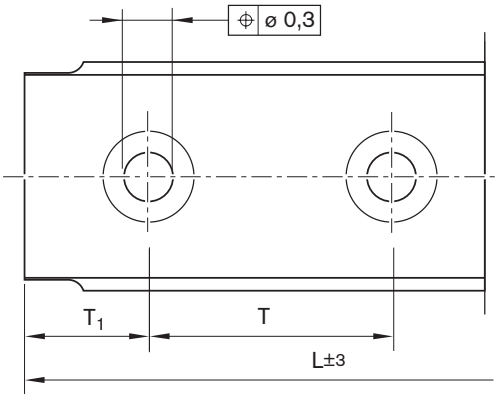
Size -Version	Standard length[1] (mm)	L_{max} (mm)	without holes Part number Length:,...(mm)	with holes Part number Length:,...(mm)	Mounting hole plugs Part number Quantity:,...	Holes per meter [1]
20	3500	7000	R1921 019 31,...	R1921 119 31,...	R1605 800 80,...	16
25	3500	7000	R1921 025 31,...	R1921 125 31,...	R1605 800 80,...	16
32	3500	7000	R1921 032 31,...	R1921 132 31,...	R1605 200 80,...	8
32-2	3500	7000	–	R1921 232 31,...	R1605 200 80,...	16
42	3500	7000	R1921 042 31,...	R1921 142 31,...	R1605 300 80,...	8
52	3500	7000	R1921 052 31,...	R1921 152 31,...	R1605 400 90,...	4
52-2	3500	7000	–	R1921 252 31,...	R1605 400 90,...	8
52-4	3500	7000	–	R1921 452 31,...	R1605 500 90,...	16

1) Running tracks up to 3500 mm are made of one-piece precision steel shafts.
2) Number for one meter at preferred length T_{1S}

Size -Version	Hole spacing T (mm)	Recommended rail lengths Number of holes/Rail length L (mm)			
20, 25, 32-2, 52-4	62,5	2/121	10/621	18/1121	40/2496
		4/246	12/746	20/1246	50/3125
		6/371	14/871	24/1496	56/3496
		8/496	16/996	30/1871	
32, 42, 52-2	125	2/246	10/1246	18/2246	28/3496
		4/496	12/1496	20/2496	
		6/746	14/1746	22/2746	
		8/996	16/1996	24/2996	
52	250	2/496	6/1496	14/3496	
		3/746	8/1996		
		4/996	10/2496		
		5/1246	12/2996		



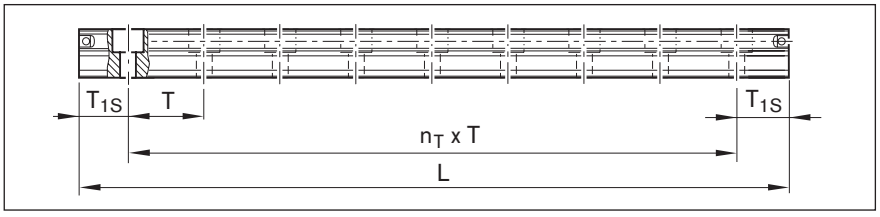
Size 42



Shown rotated through 90°
Mounting hole drilling pattern not to scale

Size -Version	Dimensions (mm) A	A_1	H	H_1	H_2	D	S_1	S_2	T	T_{1S}	$T_{1\ min.}$	Mass (kg)
20	20	17	12	5,0	9,0	9,4	4,5	4	62,5	29,25	13	0,60
25	25	21	15	6,0	10,6	9,4	5,5	6	62,5	29,25	13	1,00
32	32	24	20	9,5	15,0	11,0	6,5	6	125,0	60,50	13	1,60
32-2	32	24	20	9,5	15,0	11,0	6,5	6	62,5	29,25	13	1,60
42	42	28	20	9,0	12,6	15,0	9,0	10	125,0	60,50	13	2,68
52	52	40	34	19,0	25,1	20,0	11,0	10	250,0	123,00	20	4,40
52-2	52	40	34	19,0	25,1	20,0	11,0	10	125,0	60,50	20	4,40
52-4	52	40	34	17,0	25,1	24,0	13,0	10	62,5	29,25	20	4,40

Ordering a guide rail



Calculating guide rail length

Recommendation:
Use preferred length T_{1S}.
- Observe minimum spacing $T_{1\ min}$! (see table)
- T_1 is the same at either end of the rail.

$L = n_B \cdot T - 4$
or
$L = n_T \cdot T + 2 \cdot T_{1S}$

L = rail length (mm)
T = hole spacing*) (mm)
T_{1S} = preferred dimension*) (mm)
n_B = number of holes
n_T = number of spaces
*) see table for values

Ordering example

Guide rail: size 25
Desired length: 620 to 625 mm
n_B = 620/T = 620/62.5 = 9.92
rounded to whole numbers
= 10 holes,
n_T = n_B - 1 = 9

Rail ordering data:
Part number, length (mm)
T_1 / n_T x T / T_1 (mm)
R1921 125 31, 621
29,25 / 9 x 62,5 / 29,25
Mounting hole plug ordering data:
Part number, quantity
R1605 800 90, 10

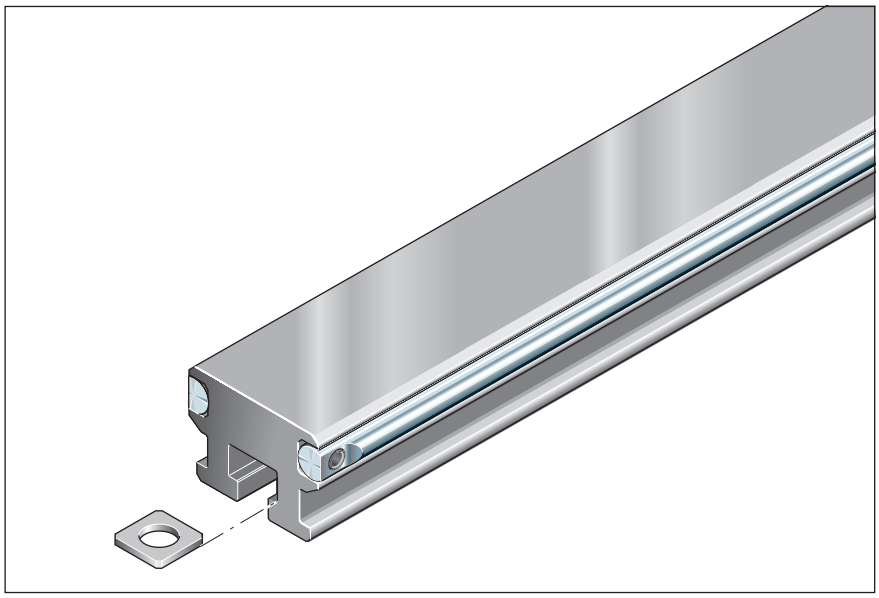
Length to be ordered

L = $10 \cdot 62.5 - 4 = 621$ mm or
L = $9 \cdot 62.5 + 2 \cdot 29.25 = 621$ mm

Guide Rails

Guide Rail with T-slot R1922

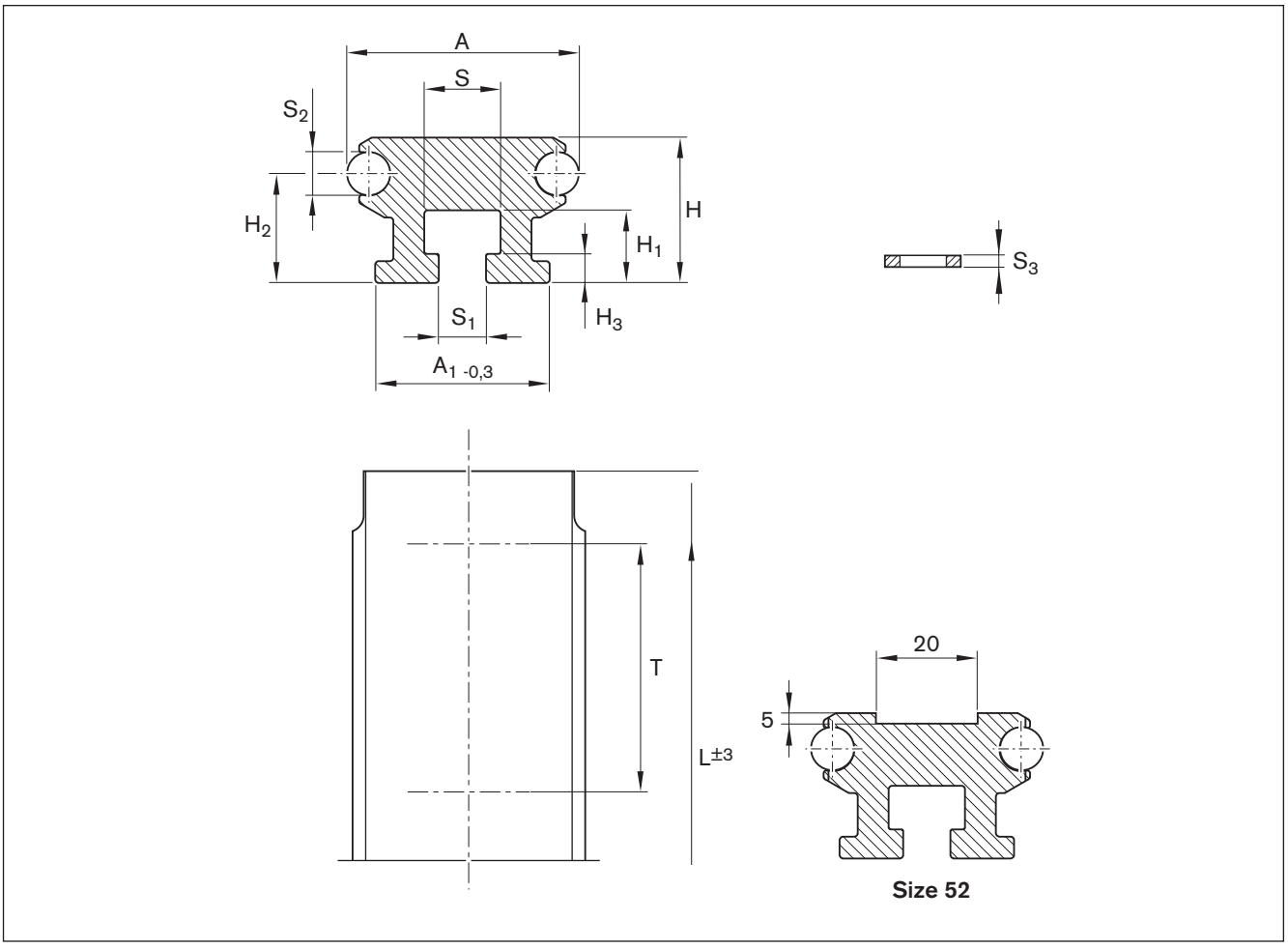
- For mounting from below
- Washers supplied (quantity according to spacing T)
- Corrosion resistant steel shafts to DIN EN ISO 683-17 / EN 10088



Part numbers, lengths

Guide Rail with T-slot			
Size	**Standard length[1)]**	**L_{max} (mm)**	**Part number Length:,...(mm)**
25	3500	7000	R1922 025 31,...
32			R1922 032 31,...

1) Running tracks up to 3500 mm are made of one-piece precision steel shafts.



Size 52

Note

See "Mounting Instructions, Guide Rail Mounting".

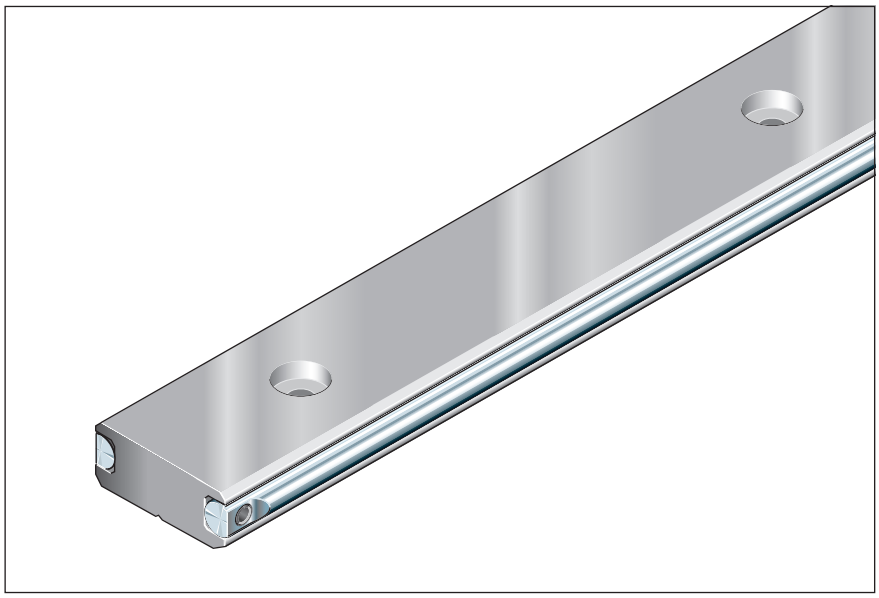
Dimensions (mm)												Mass
Size	**A**	**A_1**	**H**	**H_1**	**H_2**	**H_3**	**S**	**S_1**	**S_2**	**S_3**	**T**	**(kg/m)**
25	25	21	15	8,0	10,6	3,0	8,2	5,5	6	1,0	62,5	0,95
32	32	24	20	10,0	15,0	4,0	10,5	6,5	6	1,6	125,0	1,60

T = Maximum distance between mounting screws

Guide Rails

Guide Rail, low profile R1924

– Corrosion resistant steel shafts to DIN EN ISO 683-17 / EN 10088

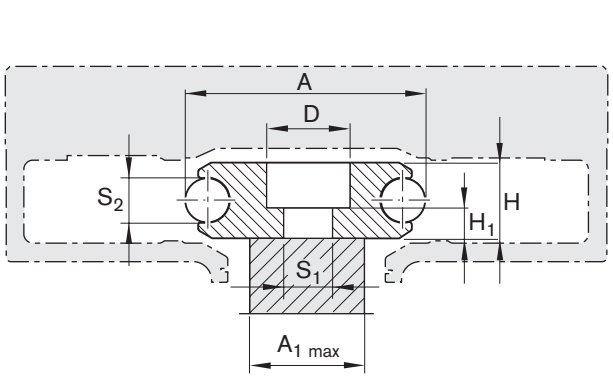


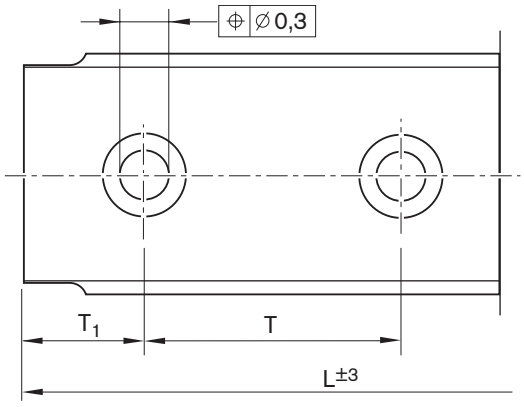
Part numbers, lengths

Guide Rail, low profile			without holes	with holes
Size	Standard length[1] (mm)	L_{max} (mm)	Part number Length:,...(mm)	Part number Length:,...(mm)
32	3500	7000	R1924 032 31,...	R1924 132 31,...
32-2	3500	7000	–	R1924 232 31,...
52	3500	7000	R1924 052 31,...	R1924 152 31,...
52-2	3500	7000	–	R1924 252 31,...
52-4	3500	7000	–	R1924 452 31,...

1) Running tracks up to 3500 mm are made of one-piece precision steel shafts.

Size -Version	Hole spacing T (mm)	Recommended rail lengths Number of holes/Rail lenth L (mm)			
32-2, 52-4	62,5	2/121	10/621	18/1121	40/2496
		4/246	12/746	20/1246	50/3125
		6/371	14/871	24/1496	56/3496
		8/496	16/996	30/1871	
32, 52-2	125	2/246	10/1246	18/2246	28/3496
		4/496	12/1496	20/2496	
		6/746	14/1746	22/2746	
		8/996	16/1996	24/2996	
52	250	2/496	6/1496	14/3496	
		3/746	8/1996		
		4/996	10/2496		
		5/1246	12/2996		

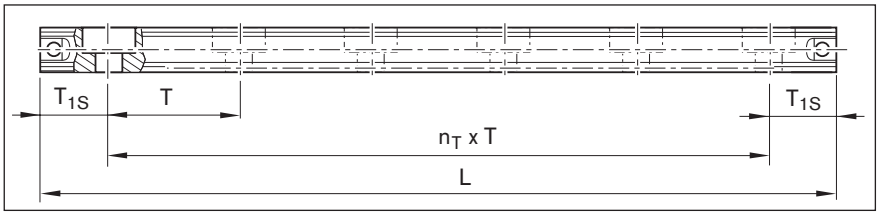




Shown rotated through 90°
Mounting hole drilling pattern not to scale

Size -Version	Dimensions (mm) A	$A_{1\ max}$	H	H_1	H_2	D	S_1	S_2	T	T_{1S}	$T_{1\ min.}$	Mass (kg)
32	32	19	10	3,5	5	11	6,5	6	125,00	60,50	13	1,1
32-2	32	19	10	3,5	5	11	6,5	6	62,50	29,25	13	1,1
52	52	32	18	7,0	9	20	11,0	10	250,00	123,00	20	3,1
52-2	52	32	18	7,0	9	20	11,0	10	125,00	60,50	20	3,1
52-4	52	32	18	7,0	9	20	11,0	10	62,50	29,25	20	3,1

Ordering a guide rail



Calculating guide rail length
Recommendation:
Use preferred length T_{1S}.
– Observe minimum spacing $T_{1\ min}$! (see table)
– T_1 is the same at either end of the rail.

$L = n_B \cdot T - 4$
or
$L = n_T \cdot T + 2 \cdot T_{1S}$

L = rail length (mm)
T = hole spacing*) (mm)
T_{1S} = preferred dimension*) (mm)
n_B = number of holes
n_T = number of spaces
*) see table for values

Ordering example

Guide rail: size 25
Desired length: 620 to 625 mm
n_B = 620/T = 620/62.5 = 9.92
rounded to whole numbers
= 10 holes,
n_T = n_B - 1 = 9

Rail ordering data:
Part number, length (mm)
T_1 / n_T x T / T_1 (mm))
R1924 232 31, 621
29,25 / 9 x 62,5 / 29,25

Length to be ordered

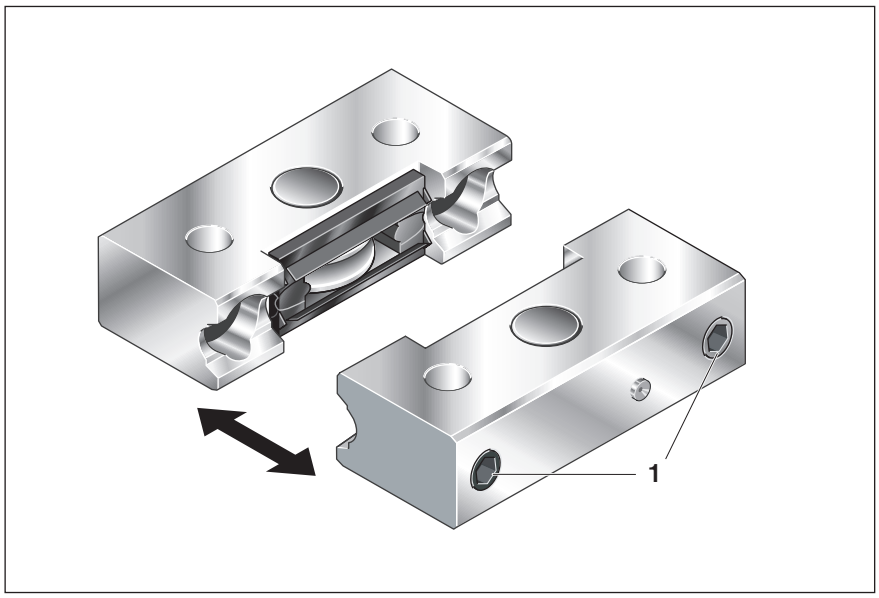
L = 10 · 62.5 - 4 = 621 mm or
L = 9 · 62.5 + 2 · 29.25 = 621 mm

Single/Double Bearing Runner Blocks with Adjustment Screws

Single Bearing Runner Blocks R1903

Special features:

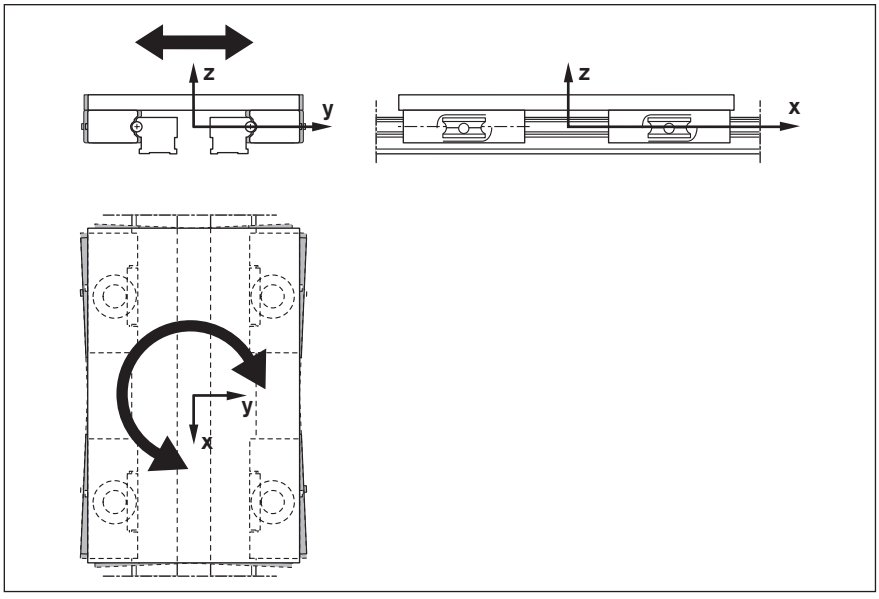
- Freely selectable carriage structure spacing.
- Zero-clearance adjustment using socket hex screws (1) on the rear side of the runner blocks.
- Tough all-round sealing gives excellent wiper performance.
  Grease lubricant recommended.



**Part numbers,
Load capacities and moment loads for calculating service life
when using four single bearing runner blocks**

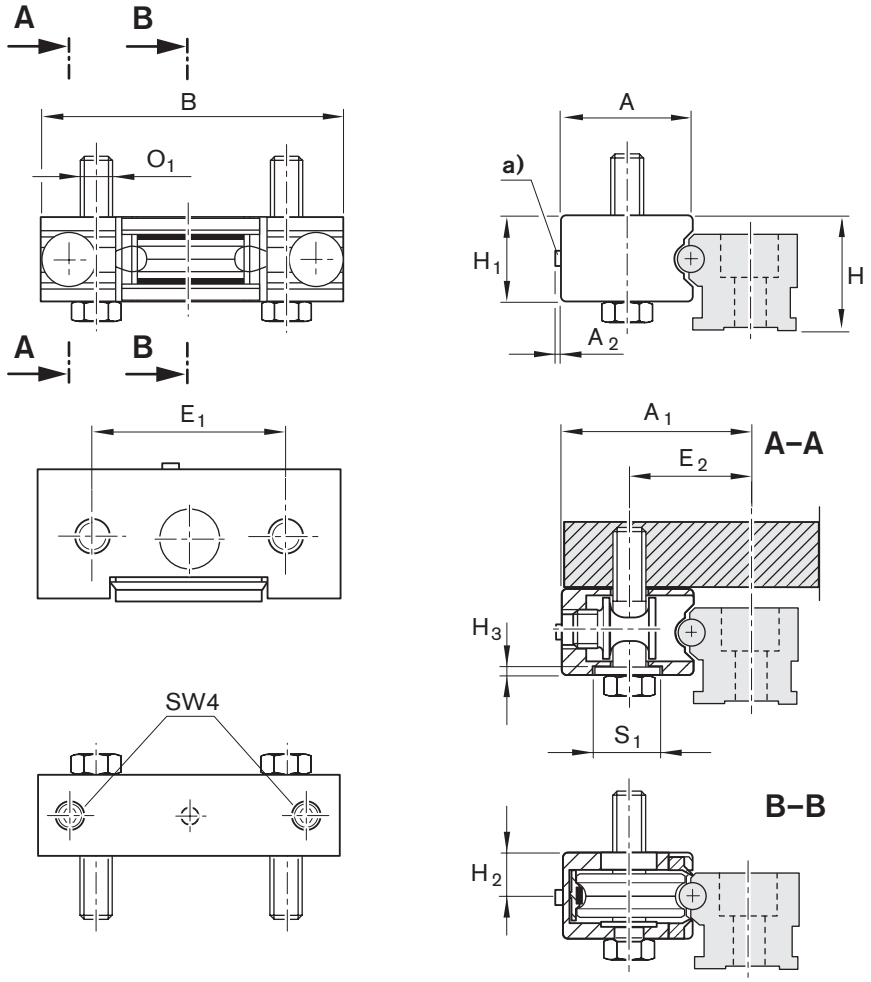
		Load capacities				Moment loads					
						a (mm)		b (mm)		b (mm)	
Size -Version	**Part number**	**C_y (N)**	**C_{y0} (N)**	**C_z (N)**	**C_{z0} (N)**	**M_x (Nm)**	**M_{xo} (Nm)**	**M_y (Nm)**	**M_{yo} (Nm)**	**M_z (Nm)**	**M_{zo} (Nm)**
32	R1903 132 10	7335	4560	4300	2200	2,1 · a	1,1 · a	2,1 · b	1,1 · b	3,6 · b	2,2 · b
52	R1903 152 10	17150	10200	10050	4900	5,0 · a	2,4 · a	5,0 · b	2,4 · b	8,5 · b	5,1 · b
52-h	R1903 252 10	27900	15400	16775	7630	8,3 · a	3,8 · a	8,3 · b	3,8 · b	13,9 · b	7,6 · b
52-sh	R1903 352 10	31000	18200	18400	8750	9,3 · a	4,4 · a	9,2 · b	4,3 · b	15,5 · b	9,1 · b

Advantage
The adjustment screws provide for zero-clearance running.
These screws can be used to rotate the runner block slightly about the z axis or shift it along the y axis to obtain optimal alignment.



Important:

Observe maximum permissible loads due to forces and moments as shown in the "Maximum Permissible Loads" tables!



a) Funnel-type lube nipple ø 3 mm

Size-Version	Dimensions (mm) A	A_1	A_2	B	H	H_1	H_2	H_3	E_1	E_2	S_1	O_1[1)]	Mass (kg)
32	31,0	43,0	2	87,0	26	20,5	11,0	2,5	54	27,0	18	M8	0,13
52	44,5	65,0	2	104,0	40	29,5	14,9	2,5	66	42,0	22	M10	0,34
52-h	52,0	72,5	2	118,5	42	33,5	16,9	3,0	76	45,0	26	M12	0,51
52-sh	57,0	77,5	2	123,5	42	33,5	16,9	3,0	81	47,5	26	M12	0,61

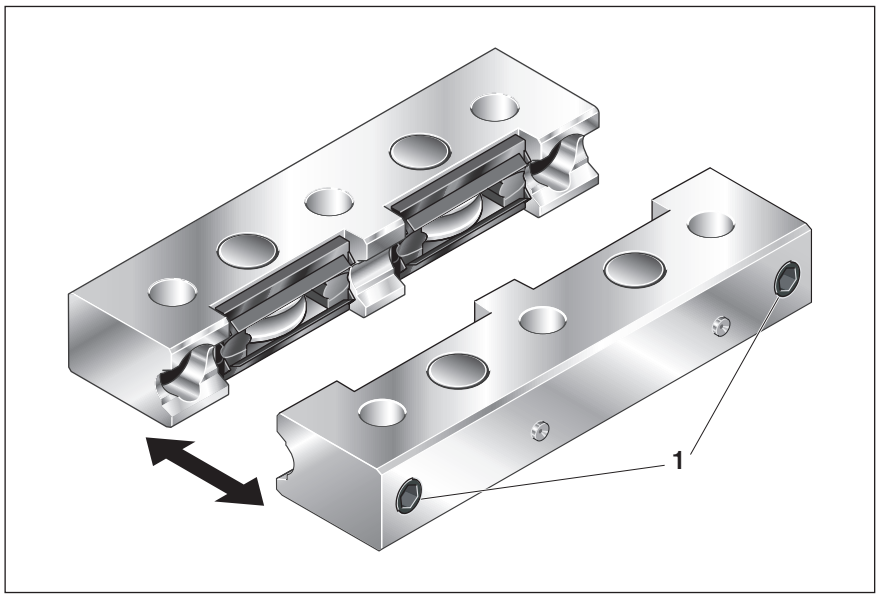
1) Mounting screws are not included in the supply.
For screws to ISO 4014 8.8, install a washer to ISO 7089

Single/Double Bearing Runner Blocks with Adjustment Screws

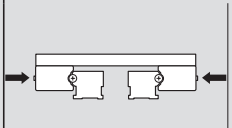
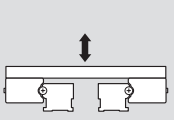
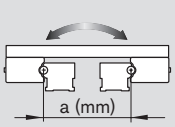
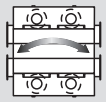
Single Bearing Runner Blocks R1904

Special features:

- Freely selectable carriage structure spacing.
- Zero-clearance adjustment using socket hex screws (1) on the rear side of the runner blocks.
- Tough all-round sealing gives excellent wiper performance.
  Grease lubricant recommended.

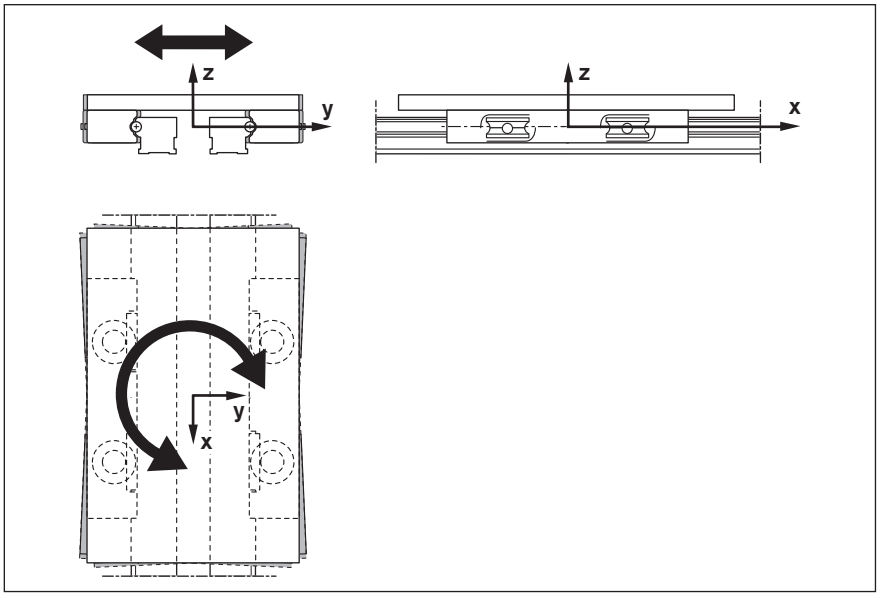


**Part numbers,
Load capacities and moment loads for calculating service life
when using two double bearing runner blocks**

		Load capacities				Moment loads					
											
Size -Version	**Part number**	**C_y (N)**	**C_{y0} (N)**	**C_z (N)**	**C_{z0} (N)**	**M_x (Nm)**	**M_{xo} (Nm)**	**M_y (Nm)**	**M_{yo} (Nm)**	**M_z (Nm)**	**M_{zo} (Nm)**
32	R1904 132 10	7335	4560	4300	2200	2,1 · a	1,1 · a	105	55	180	110
52	R1904 152 10	17150	10200	10050	4900	5,0 · a	2,4 · a	330	158	561	337
52-h	R1904 252 10	27900	15400	16775	7630	8,3 · a	3,8 · a	631	289	1056	578
52-sh	R1904 352 10	31000	18200	18400	8750	9,3 · a	4,4 · a	740	350	1260	740

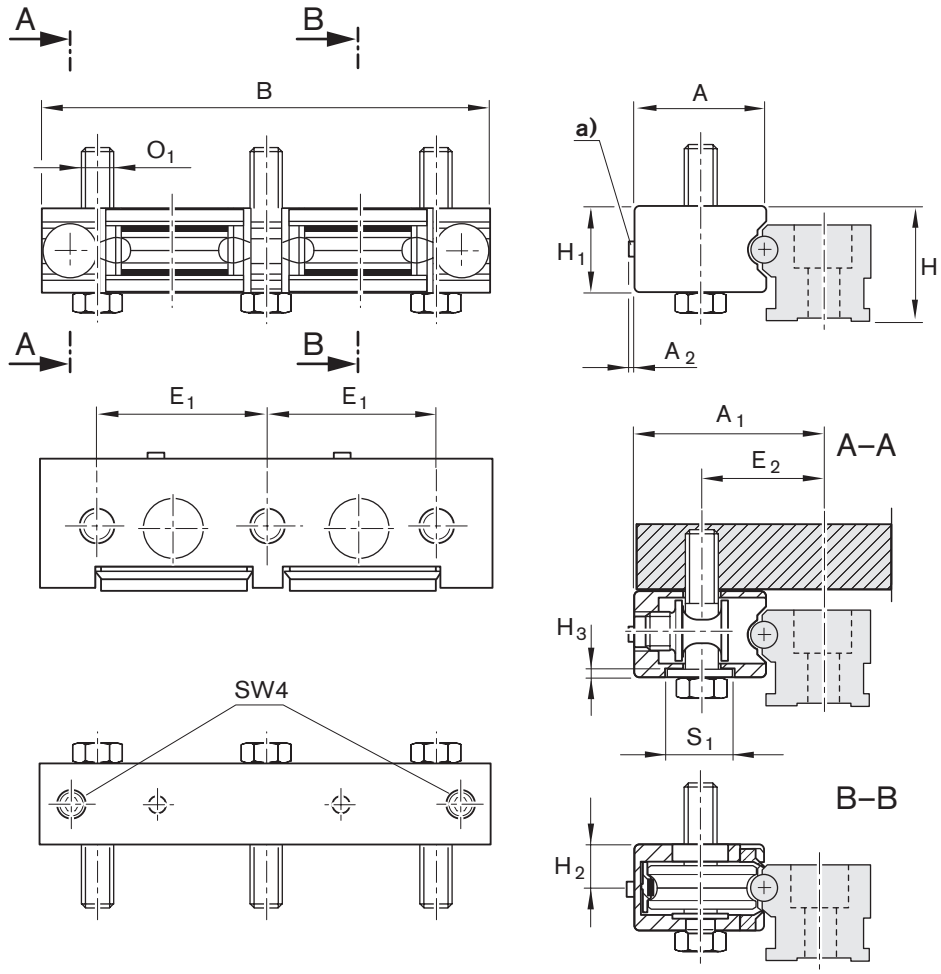
Advantage

The adjustment screws provide for zero-clearance running.
These screws can be used to rotate the runner block slightly about the z axis or shift it along the y axis to obtain optimal alignment.



Important:

Observe maximum permissible loads due to forces and moments as shown in the "Maximum Permissible Loads" tables!



a) Funnel-type lube nipple ø 3 mm

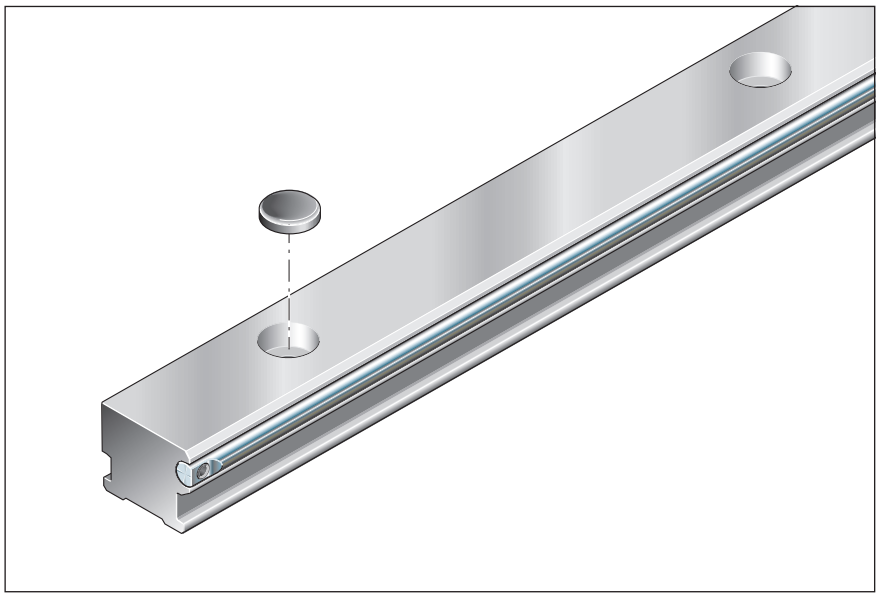
Size-Version	Dimensions (mm) A	A_1	A_2	B	H	H_1	H_2	H_3	E_1	E_2	S_1	O_1[1)]	Mass (kg)
32	31,0	43,0	2	129,0	26	20,5	11,0	2,5	48,0	27,0	18	M8	0,20
52	44,5	65,0	2	159,0	40	29,5	14,9	2,5	60,5	42,0	22	M10	0,53
52-h	52,0	72,5	2	184,5	42	33,5	16,9	3,0	71,0	45,0	26	M12	0,82
52-sh	57,0	77,5	2	194,5	42	33,5	16,9	3,0	76,0	47,5	26	M12	1,01

1) Mounting screws are not included in the supply.
For screws to ISO 4014 8.8, install a washer to ISO 7089

Guide Rails for Bearing Runner Blocks

Guide Rail standard half-rail R1925

- For mounting from above
- Optional mounting hole plugs
- Corrosion resistant steel shafts to DIN EN ISO 683-17 / EN 10088



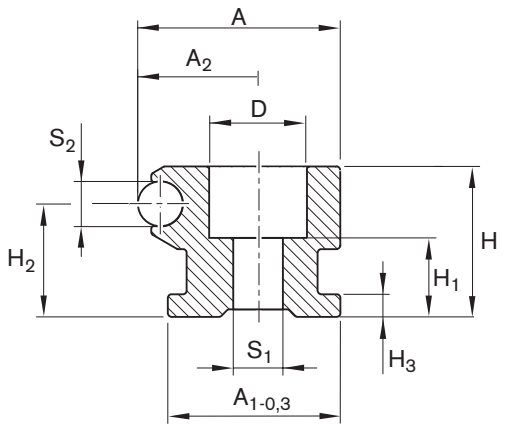
Part numbers, lengths

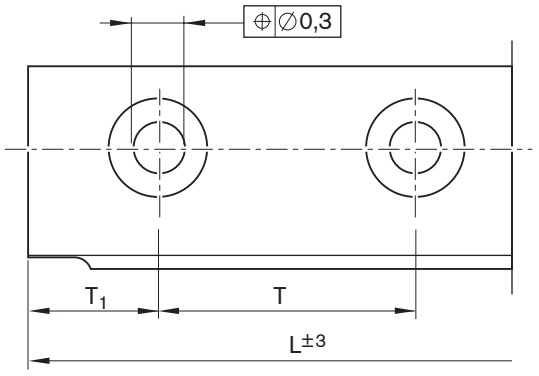
Guide rail: standard half-rail			without holes	with holes	Mounting hole plugs (optional)	
Size -Version	Standard length[1] (mm)	L_{max} (mm)	Part number Length:,...(mm)	Part number Length:,...(mm)	Part number Quantity:,...	Holes per meter[2]
32	3500	7000	R1925 032 31,...	R1925 132 31,...	R1605 200 80,...	8
32-2			–	R1925 232 31,...	R1605 200 80,...	16
52			R1925 052 31,...	R1925 152 31,...	R1605 400 90,...	4
52-2			–	R1925 252 31,...	R1605 400 90,...	8
52-4			–	R1925 452 31,...	R1605 500 90,...	16

1) Running tracks up to 3500 mm are made of one-piece precision steel shafts.

2) Number for one meter at preferred length T_{1S}

Size -Version	Hole spacing T (mm)	Recommended rail length Number of holes/Rail length L (mm)			
32-2, 52-4	62,5	2/121	10/621	18/1121	40/2496
		4/246	12/746	20/1246	50/3125
		6/371	14/871	24/1496	56/3496
		8/496	16/996	30/1871	
32, 52-2	125	2/246	10/1246	18/2246	28/3496
		4/496	12/1496	20/2496	
		6/746	14/1746	22/2746	
		8/996	16/1996	24/2996	
52	250	2/496	6/1496	14/3496	
		3/746	8/1996		
		4/996	10/2496		
		5/1246	12/2996		

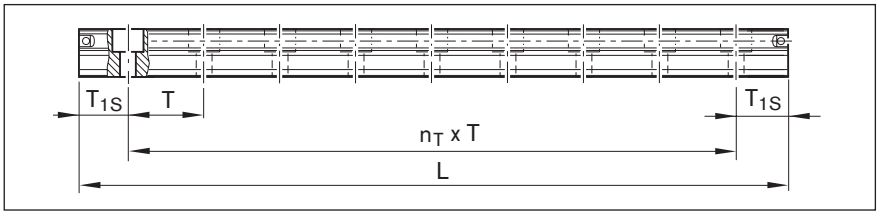




Shown rotated through 90°
Mounting hole drilling pattern not to scale

Size	Dimensions (mm)													Mass
-Version	A	A_1	A_2	H	H_1	H_2	H_3	D	S_1	S_2	T	T_{1S}	$T_{1\ min.}$	(kg/m)
32	26	22	16	20	9,5	15,0	3	11,0	6,5	6	125,0	60,50	13	1,3
32-2	26	22	16	20	9,5	15,0	3	11,0	6,5	6	62,5	29,25	13	1,3
52	42	36	26	34	19,0	25,1	5	20,0	11,0	10	250,0	123,00	20	3,5
52-2	42	36	26	34	19,0	25,1	5	20,0	11,0	10	125,0	60,50	20	3,5
52-4	42	36	26	34	17,0	25,1	5	24,0	13,0	10	62,5	29,25	20	3,5

Ordering a guide rail



Calculating guide rail length

Recommendation:
Use preferred length T_{1S}.
- Observe minimum spacing $T_{1\ min}$! (see table)
- T_1 is the same at either end of the rail.

$L = n_B \cdot T - 4$
or
$L = n_T \cdot T + 2 \cdot T_{1S}$

L = rail length (mm)
T = hole spacing*) (mm)
T_{1S} = preferred dimension*) (mm)
n_B = number of holes
n_T = number of spaces
*) see table for values

Ordering example

Guide rail: size 25
Desired length: 620 to 625 mm
n_B = 620/T = 620/62.5 = 9.92
rounded to whole numbers
= 10 holes,
n_T = n_B - 1 = 9

Rail ordering data:
Part number, length (mm)
T_1 / n_T x T / T_1 (mm)
R1925 232 31, 621
29,25 / 9 x 62,5 / 29,25
Mounting hole plug ordering data:
Part number, quantity
R1605 200 90, 10

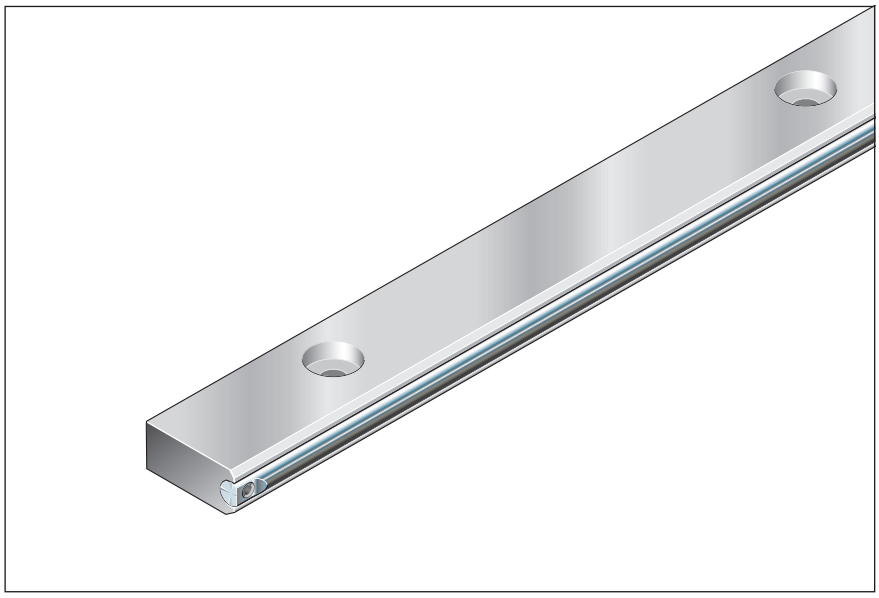
Length to be ordered

L = 10 · 62.5 - 4 = 621 mm or
L = 9 · 62.5 + 2 · 29.25 = 621 mm

Guide Rails for Bearing Runner Blocks

Guide Rail low-profile, half-rail R1926

- For mounting from above
- Corrosion resistant steel shafts to DIN EN ISO 683-17 / EN 10088

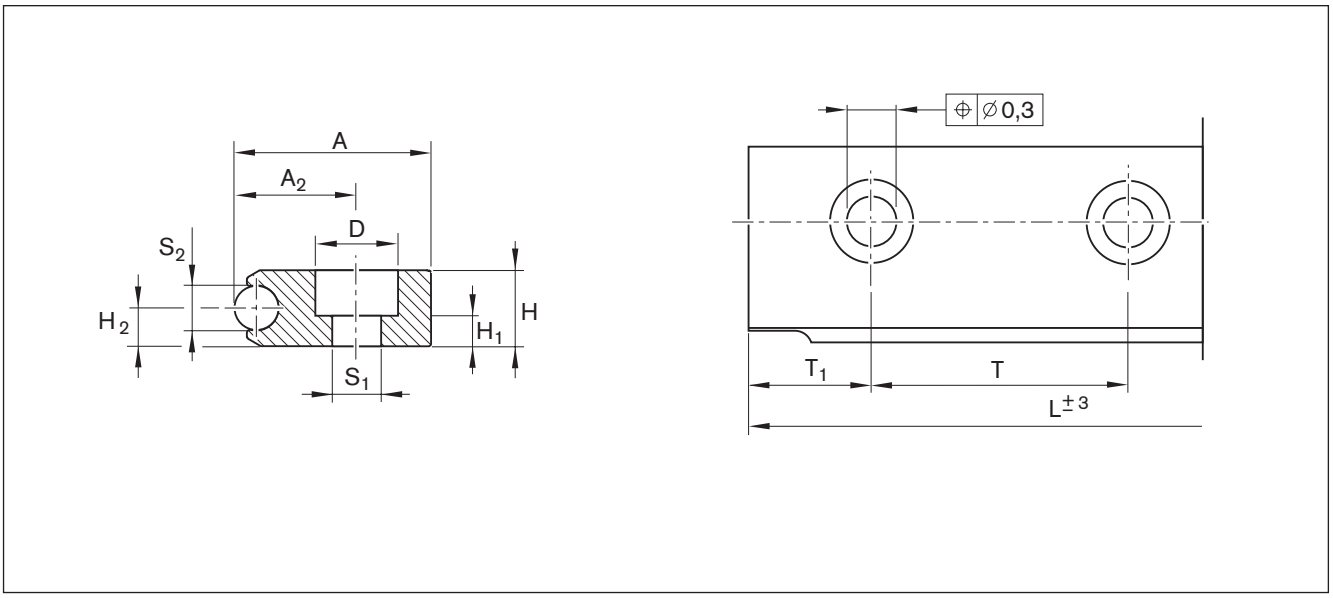


Part numbers, lengths

Guide rail: low-profile, half-rail			without holes	with holes
Size -Version	Standard length[1] (mm)	L_{max} (mm)	Part number Length:,...(mm)	Part number Length:,...(mm)
32	3500	7000	R1926 032 31,...	R1926 132 31,...
32-2			–	R1926 232 31,...
52			R1926 052 31,...	R1926 152 31,...
52-2			–	R1926 252 31,...
52-4			–	R1926 452 31,...

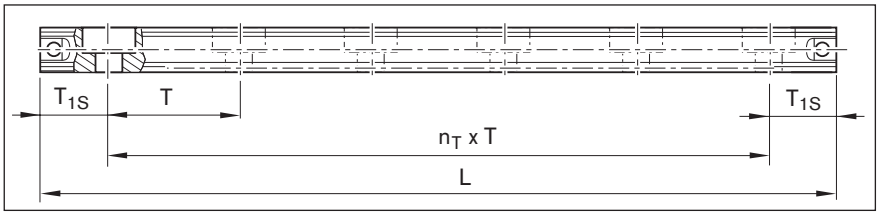
1) Running tracks up to 3500 mm are made of one-piece precision steel shafts.

Size -Version	Hole spacing T (mm)	Recommended rail length Number of holes/Rail length L (mm)			
32-2, 52-4	62,5	2/121	10/621	18/1121	40/2496
		4/246	12/746	20/1246	50/3125
		6/371	14/871	24/1496	56/3496
		8/496	16/996	30/1871	
32, 52-2	125	2/246	10/1246	18/2246	28/3496
		4/496	12/1496	20/2496	
		6/746	14/1746	22/2746	
		8/996	16/1996	24/2996	
52	250	2/496	6/1496	14/3496	
		3/746	8/1996		
		4/996	10/2496		
		5/1246	12/2996		



Size -Version	Dimensions (mm) A	A2	H	H1	H2	D	S1	S2	T	T1S	T1 min.	Mass (kg/m)
32	26	16	10	3,5	5	11,0	6,5	6	125,0	60,50	13	0,8
32-2	26	16	10	3,5	5	11,0	6,5	6	62,5	29,25	13	0,8
52	42	26	18	7,0	9	20,0	11,0	10	250,0	123,00	20	2,3
52-2	42	26	18	7,0	9	20,0	11,0	10	125,0	60,50	20	2,3
52-4	42	26	18	7,0	9	24,0	13,0	10	62,5	29,25	20	2,3

Ordering a guide rail



Calculating guide rail length

Recommendation:
Use preferred length T_{1S}.
- Observe minimum spacing $T_{1\ min}$! (see table)
- T_1 is the same at either end of the rail.

$L = n_B \cdot T - 4$
or
$L = n_T \cdot T + 2 \cdot T_{1S}$

L = rail length (mm)
T = hole spacing*) (mm)
T_{1S} = preferred dimension*) (mm)
n_B = number of holes
n_T = number of spaces
*) see table for values

Ordering example

Guide rail: size 25
Desired length: 620 to 625 mm
n_B = 620/T = 620/62.5 = 9.92
rounded to whole numbers
= 10 holes,
n_T = n_B - 1 = 9

Rail ordering data:
Part number, length (mm)
T_1 / n_T x T / T_1 (mm)
R1926 232 31, 621
29,25 / 9 x 62,5 / 29,25

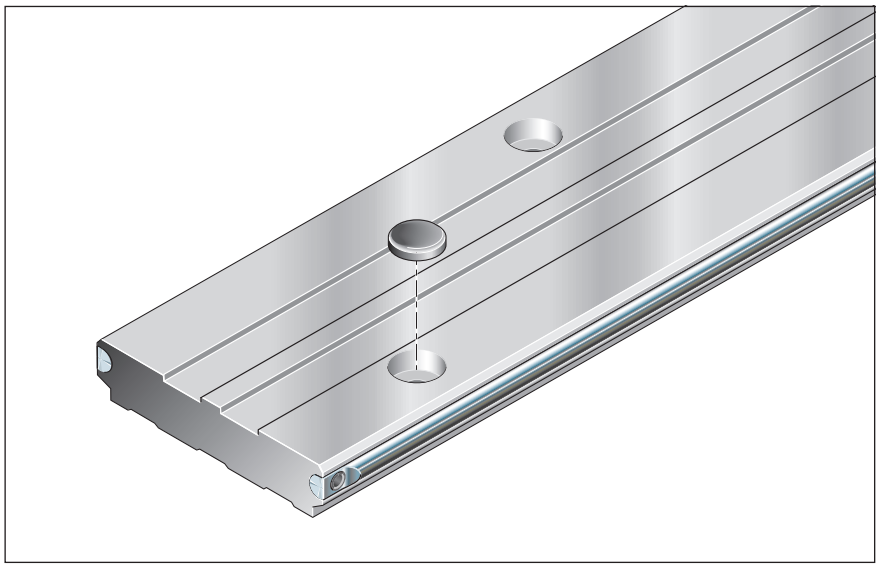
Length to be ordered

L = 10 · 62.5 - 4 = 621 mm or
L = 9 · 62.5 + 2 · 29.25 = 621 mm

Guide Rails for Bearing Runner Blocks

Guide Rail wide R1927

- For mounting from above
- Optional mounting hole plugs
- Corrosion resistant steel shafts to DIN EN ISO 683-17 / EN 10088



Part numbers, lengths

Guide rail: wide			without holes	with holes	Mounting hole plugs (optional)	
Size -Version	Standard length[1] (mm)	L_{max} (mm)	Part number Length:,...(mm)	Part number Length:,...(mm)	Part number Quantity:,...	Holes per meter[2]
52/120	3500	7000	R1927 052 31,...	R1927 152 31,...	R1605 400 90,...	8

1) Running tracks up to 3500 mm are made of one-piece precision steel shafts

2) Number for one meter at preferred length

Ordering a guide rail

Wherever possible, use the recommended rail lengths (1.).
Intermediate lengths (2.) or special lengths (3.) may also be manufactured on request.
Please check at $T_1 > T$.

L = rail length (mm)
n_B = number of holes (both rows)
n_T = number of spaces between holes ($n_T = n_B - 1$)
T_1, T_2 = end spaces, see drawings (mm)
T = hole spacing (125 mm)

Ordering data

1. Recommended rail length:
   Odd number of holes n_B
   $T_1 \neq T_2$

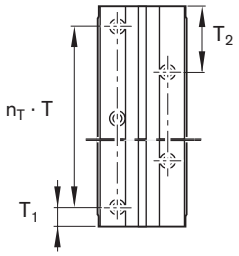
Preferred dimensions T_1: 60.5 mm, T_2: 185.5 mm

By turning the rail over it is possible to alternate between mounting hole pattern 1a) and 1b). When this is done, T_1 becomes T_2 and vice versa.

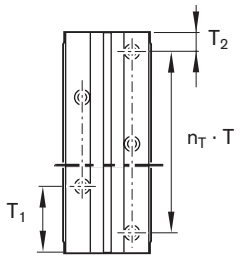
Rail ordering data:
Part number, length L (mm)
T_1 / n_T x T / T_2 (mm)

Mounting hole plug ordering data:
Part number, quantity = n_B
Example: R1605 400 90, 11

1 a)



1 b)



Calculating the rail length

- Observe minimum spacing $T_{1,2\ min}$! (see table)

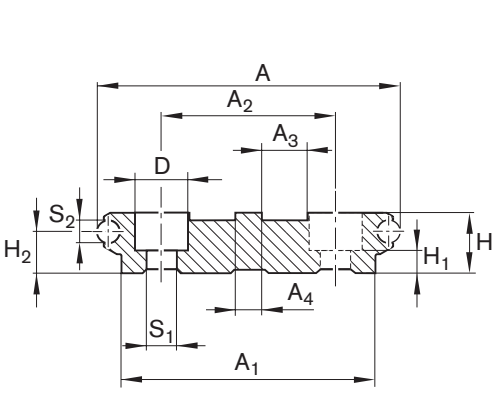
(1) $L = n_B \cdot 125 - 4$
or
(2) $L = n_T \cdot 125 + 121$

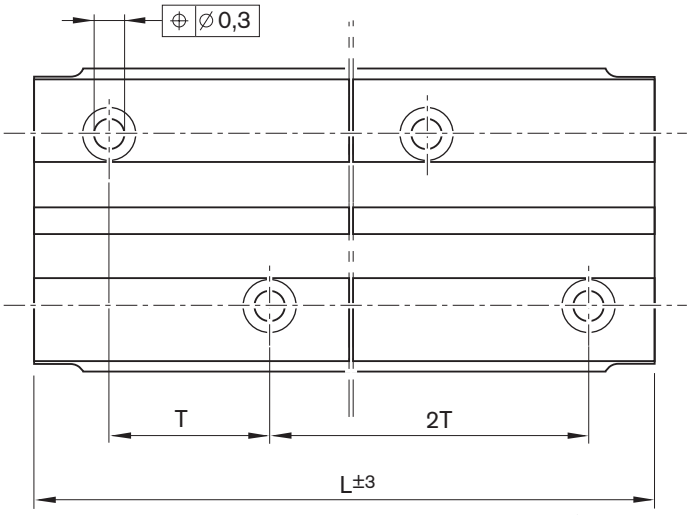
Example:
(1) $L = 11 \cdot 125 - 4 = 1371$ mm or
(2) $L = 10 \cdot 125 + 121 = 1371$ mm

Ordering example for recommended rail length

R1927 152 31, 1371
60,5 / 10 x 125 / 185,5

Number of holes $n_B = 11$
Number of spaces between holes $n_T = 10$





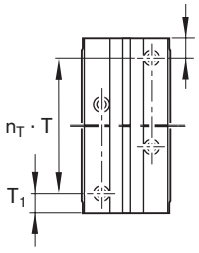
Shown rotated through 90°
Mounting hole drilling pattern not to scale

Size -Version	Dimensions (mm) A	A_1	A_2	A_3	A_4	H	H_1	H_2	D	S_1	S_2	T	$T_{1,2\ min.}$	Mass (kg/m)
52/120	120	100	68	18	10	25	10	16,1	20	11	10	125	13	7,8

2. Intermediate length:
Even number of holes n_B

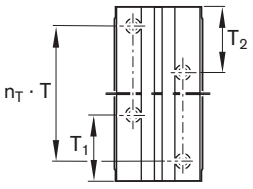
The mounting hole drilling pattern remains the same when the rail is turned over.
Dimensions T_1 and T_2 remain the same and can therefore not be matched to a different pre-drilled hole pattern.
$T_1 = T_2 = 60.5$ mm or
$T_1 = T_2 = 185.5$ mm
(preferred dimensions)
Calculate the length according to item 1. "Recommended rail length"

2 a)



Ordering example: Rail 2a:
R1927 152 31, 1496 mm
60,5 / 11 x 125 / 60,5

2 b)

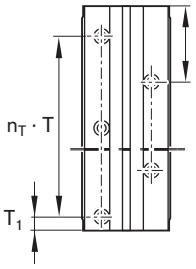


Ordering example: Rail 2b:
R1927 152 31, 1496 mm
185,5 / 11 x 125 / 185,5

3. Special length:
Odd (3a) or even (3b) number of holes n_B

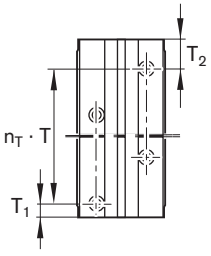
If the preferred dimensions T_1 and T_2 cannot be used (neither the recommended rail lengths nor intermediate lengths), determine T_1 and T_2 as required.
T_1 and T_2 must not fall within the following ranges:
0 to 13 and 112 to 139 mm

3 a)



Ordering example: Rail 3a:
R1927 152 31, 1305 mm
20 / 10 x 125 / 160

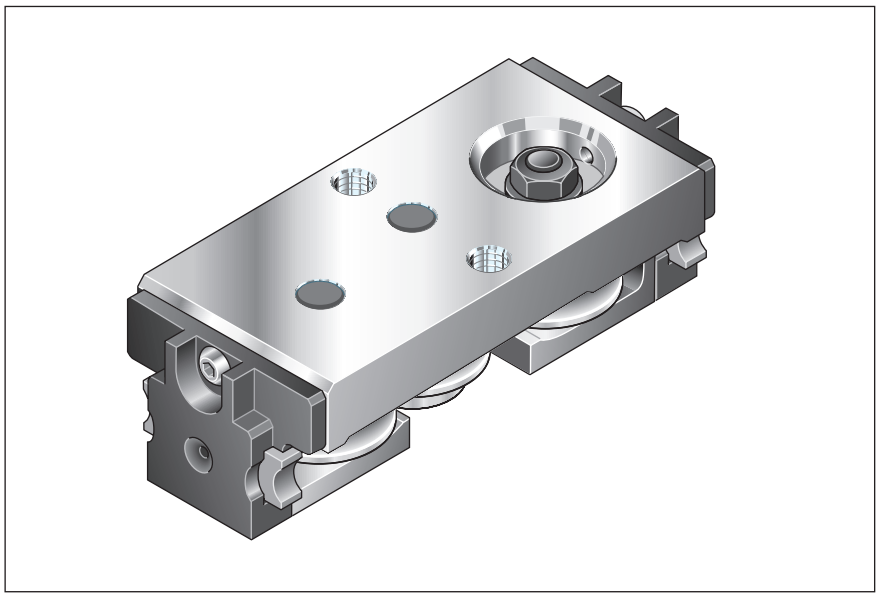
3 b)



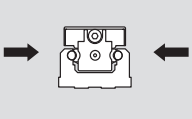
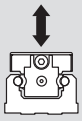
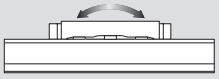
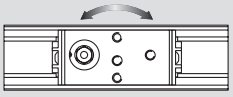
Ordering example: Rail 3b:
R1927 152 31, 1435 mm
20 / 11 x 125 / 40

U-type Cam Roller Guides

U-type Runner Block R1905

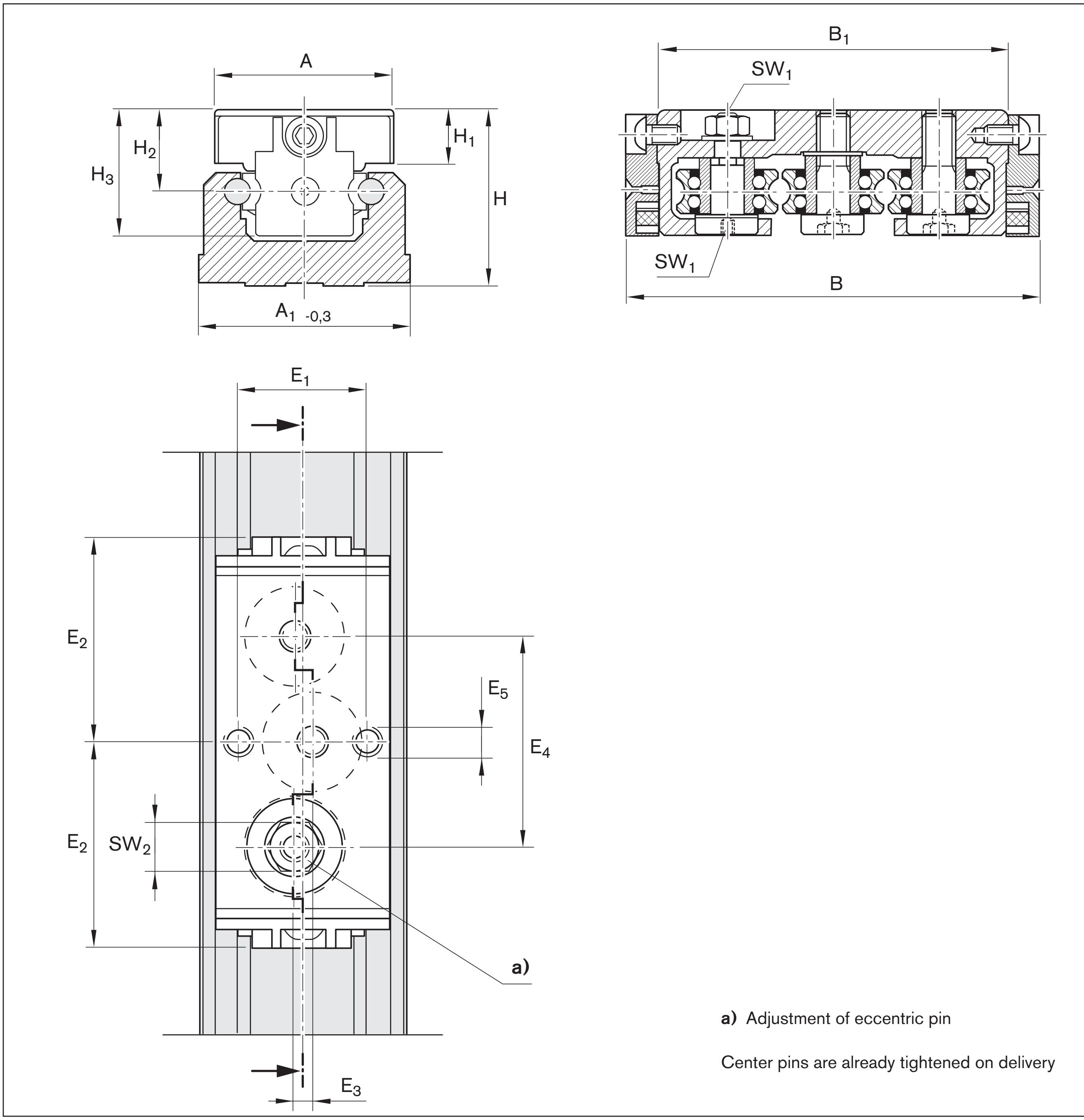


**Part numbers,
Load capacities and moment loads for calculating service life**

		Load capacities				Moment loads					
											
Size -Version	Part number	C_y (N)	C_{y0} (N)	C_z (N)	C_{z0} (N)	M_x (Nm)	M_{xo} (Nm)	M_y (Nm)	M_{yo} (Nm)	M_z (Nm)	M_{zo} (Nm)
20	R1905 119 00	1150	800	668	392	4,8	2,8	11,3	6,6	19,5	13,5

Important:

Observe maximum permissible loads due to forces and moments as shown in the "Maximum Permissible Loads" tables!



a) Adjustment of eccentric pin

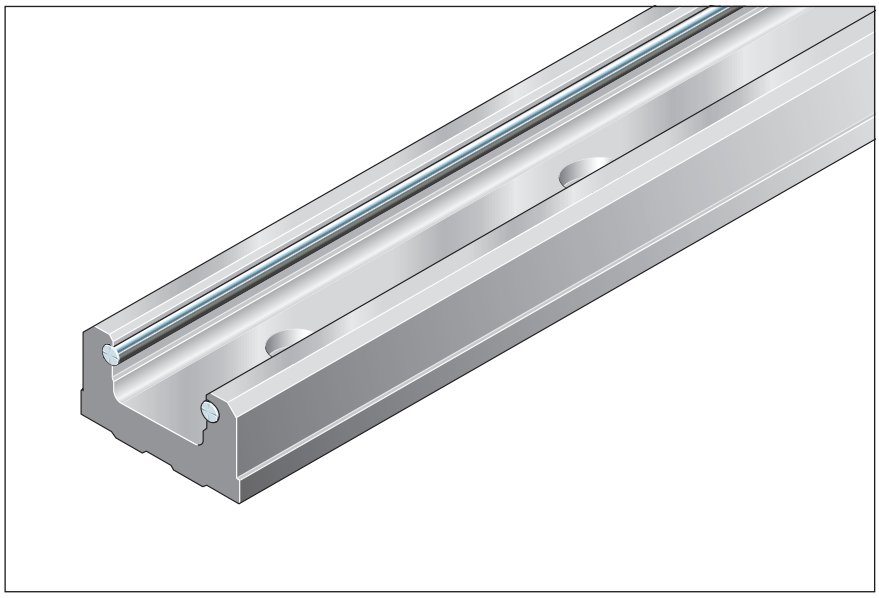
Center pins are already tightened on delivery

Size -Version	Dimensions (mm)															Mass (kg)
	A	A_1	B	B_1	H	H_1	H_2	H_3	E_1	E_2	E_3	E_4	E_5	SW_1	SW_2	
20	28	33	66	56	28	8,5	13	20	20	33	3	34	M5	2	7	0,08

U-type Cam Roller Guides

U-type Guide Rail R1923

- For mounting from above
- Corrosion resistant steel shafts to DIN EN ISO 683-17 / EN 10088

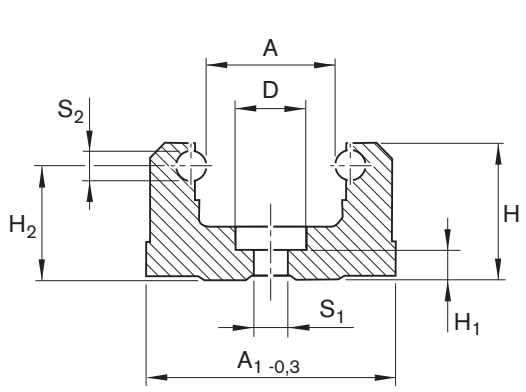


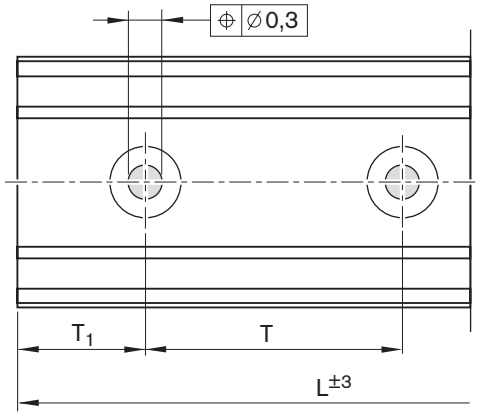
Part numbers, lengths

Guide Rail: U-type			without holes	with holes
Size	Standard length[1] (mm)	L_{max} (mm)	Part number Length:,...(mm)	Part number Length:,...(mm)
20	3500	7000	R1923 019 31,...	R1923 119 31,...

1) Running tracks up to 3500 mm are made of one-piece precision steel shafts

size -Version	Hole spacing T (mm)	Recommended rail length Number of holes/Rail length L (mm)			
20	62,5	2/121	10/621	18/1121	40/2496
		4/246	12/746	20/1246	50/3125
		6/371	14/871	24/1496	56/3496
		8/496	16/996	30/1871	

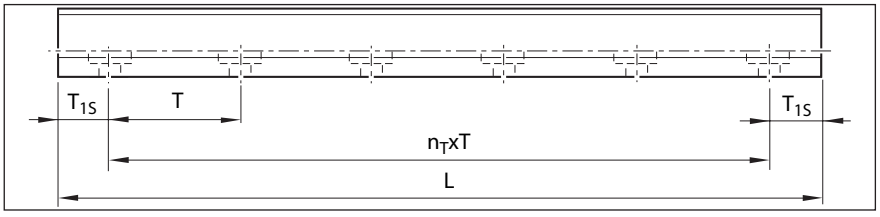




Shown rotated through 90°
Mounting hole drilling pattern not to scale

Size -Version	Dimensions (mm) A	A_1	H	H_1	H_2	D	S_1	S_2	T	T_{1S}	$T_{1\ min.}$	Mass (kg/m)
20	17	33	18	3,4	15	9,4	4	6	62,5	29,25	13	1,10

Ordering a guide rail



Calculating guide rail length
Recommendation:
Use preferred length T_{1S}.
– Observe minimum spacing $T_{1\ min}$! (see table)
– T_1 is the same at either end of the rail.

$L = n_B \cdot T - 4$
or
$L = n_T \cdot T + 2 \cdot T_{1S}$

L = rail length (mm)
T = hole spacing*) (mm)
T_{1S} = preferred dimension*) (mm)
n_B = number of holes
n_T = number of spaces
*) see table for values

Ordering example

Guide rail: size 25
Desired length: 620 to 625 mm
n_B = 620/T = 620/62.5 = 9.92
rounded to whole numbers
= 10 holes,
n_T = n_B - 1 = 9

Rail ordering data:
Part number, length (mm)
T_1 / n_T x T / T_1 (mm)
R1923 119 31, 621
29,25 / 9 x 62,5 / 29,25

Length to be ordered

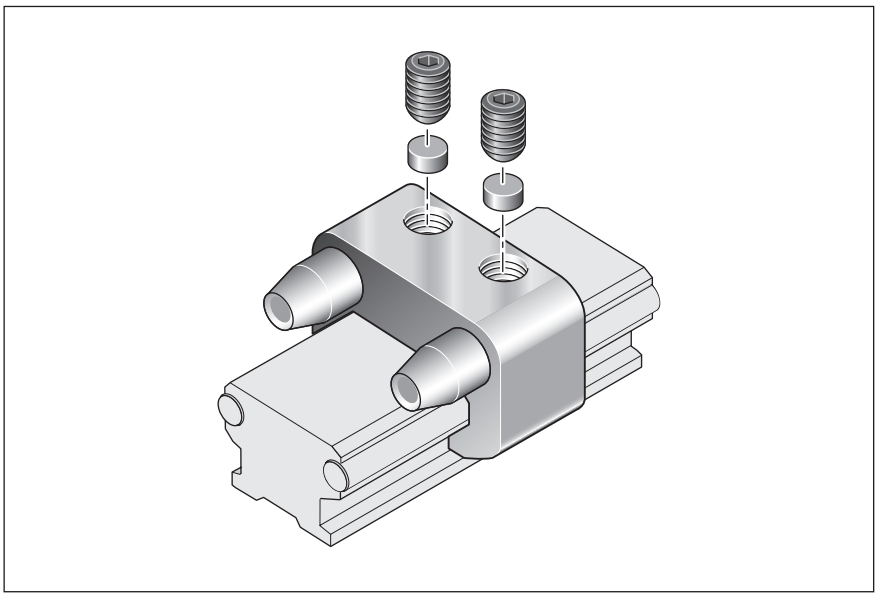
L = 10 · 62.5 - 4 = 621 mm or
L = 9 · 62.5 + 2 · 29.25 = 621 mm

Accessories

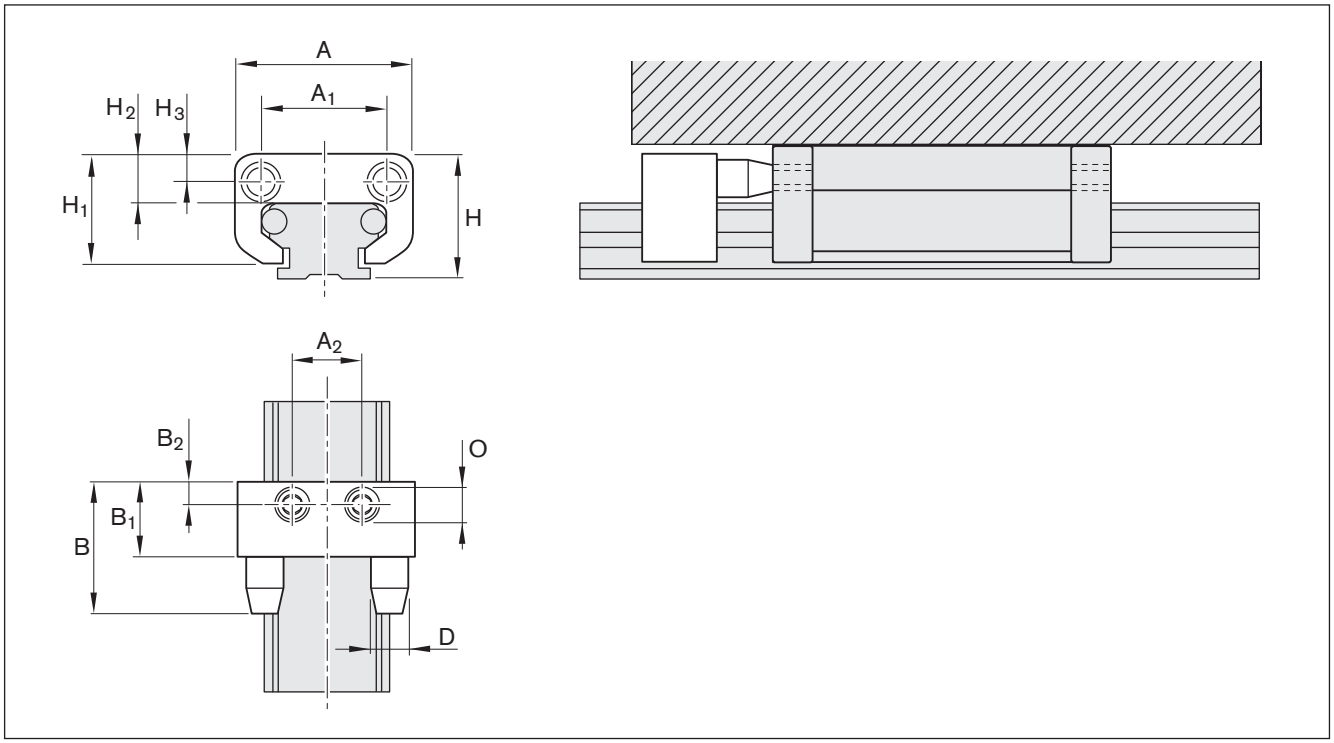
Dead stop R1910 5.. 00

The dead stop can be used with guide rails 1921- (standard),1922- (with T-slot) and 1924 (low-profile).
Holding force: 1500 N
If a set screw to ISO 7434 is used without a soft-metal pin, there will be a pressure point in the guide rail.
The resulting contour locking effect will increase the holding force.

The lubrication unit is reinforced in the area corresponding to the dead stop.



Dead stop	For guide rails	
Size	Part number	Part number
32	R1910 532 00,...	R1921, R1922, R1924
52	R1910 552 00,...	R1921, R1922, R1924



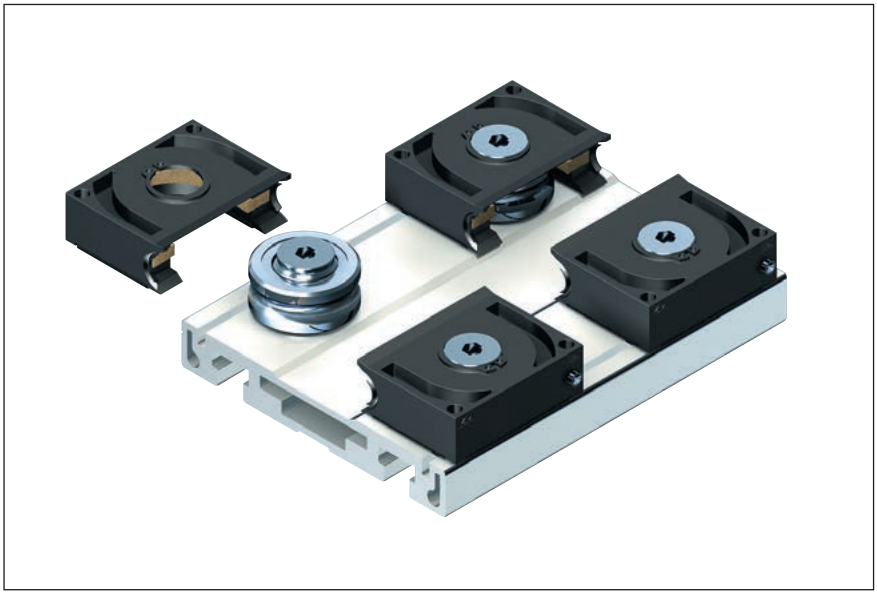
Size	Dimensions (mm)												Mass
-Version	A	A_1	A_2	B	B_1	B_2	D	H	H_1	H_2	H_3	O	(kg)
32	46	33	18	35	20	5,5	10	33,5	29	13	7,5	M8	0,05
52	70	46	32	43	23	5,5	16	53,0	42	18	9,0	M8	0,11

Lubrication unit R1910 442 00 for profile runner blocks

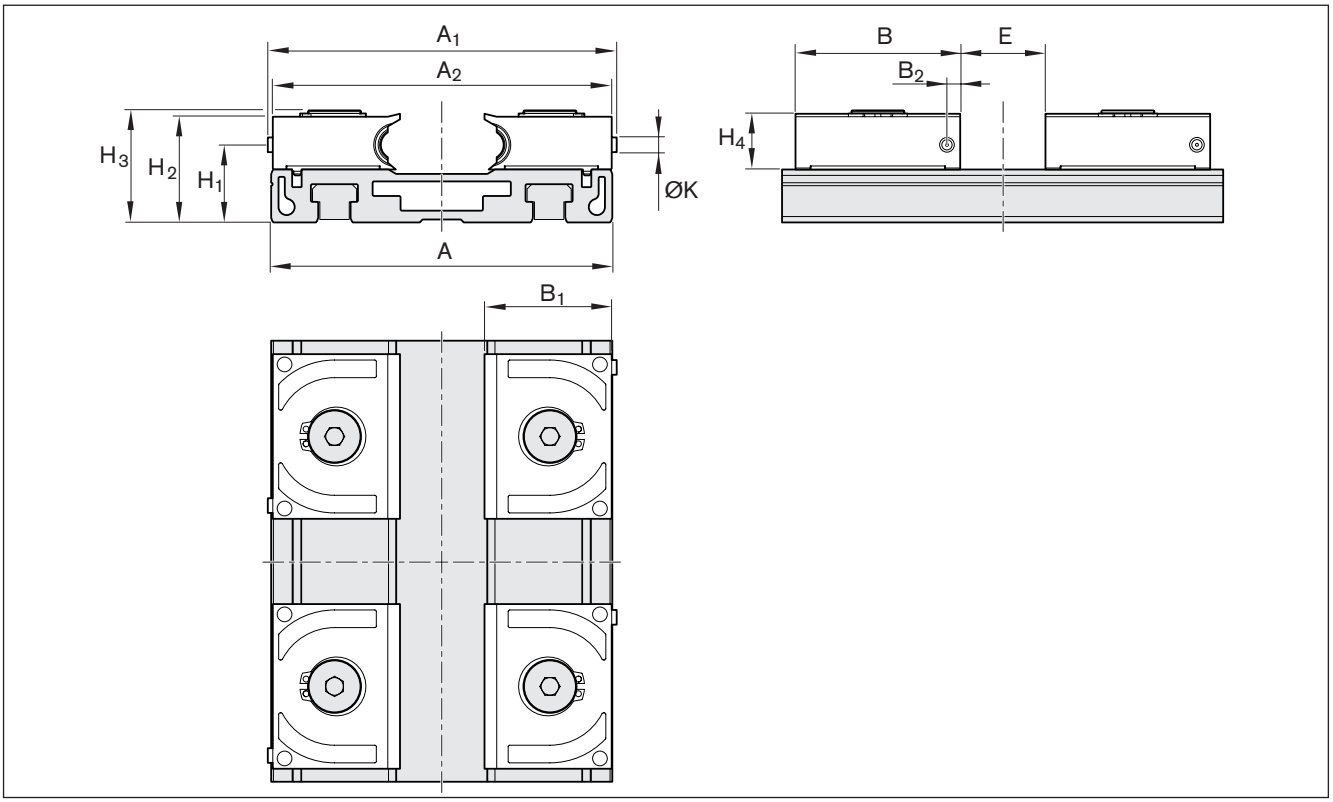
The R1910 442 00 lubrication unit was specially developed for the cam roller of the R1907 142 00 profile runner block. The lubrication unit must be filled with a lubricant oil CLP, CGLP as per DIN 51517 with a viscosity of VG 680–1000 mm^2/s as per DIN 51519.

- Fill a total of 3 cm^3 of lubricant oil per lubrication unit via lube nipple in two partial amounts of 1.5 cm^3 each at a distance of 30 min.

Four lubrication units are required for complete lubrication of the R1907 142 00 profile runner block.



Lubrication unit	For profile runner blocks	
Size	Part number	Part number
42	R1910 442 00	R1907 142 00

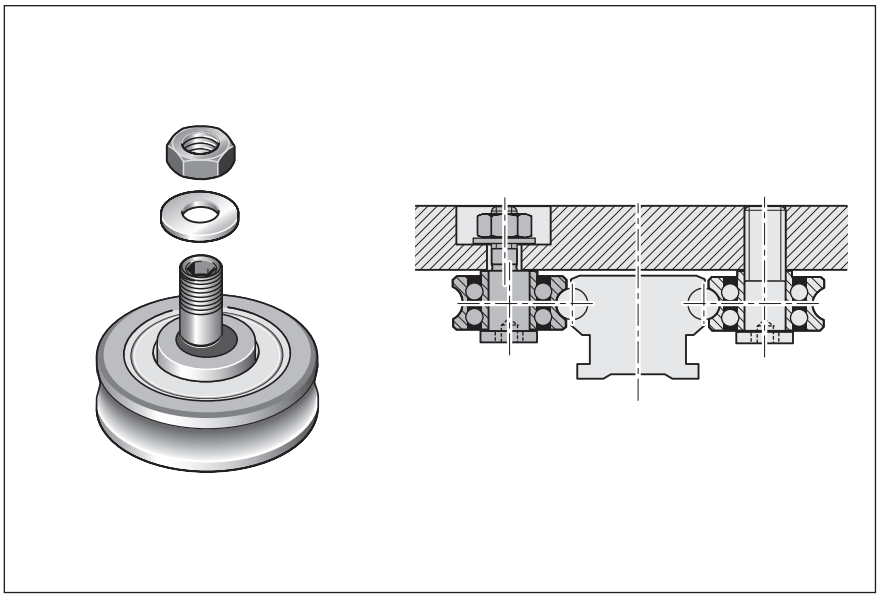


Size	Dimensions (mm)											
	A	A_1	A_2	B	B_1	B_2	H_1	H_2	H_3	H_4	E	K
42	116	118,65	115,25	56	43,25	4,5	26,25	35,8	38,1	18,8	29	5

Cam Rollers with Spigots, Assembly Kits

Cam Roller with eccentric spigot R1900 0

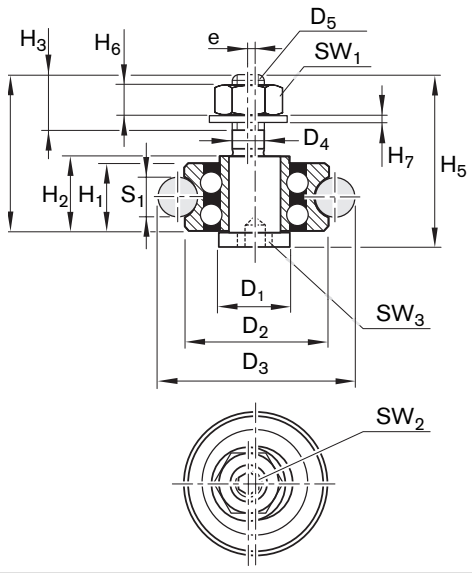
For mounting customer-built carriages, with central and eccentric spigots for zero-clearance adjustment to the guide rail.
For applications where even the versatile standard range does not offer the optimum solution to your problem.



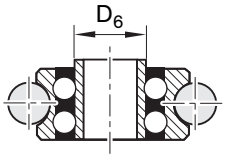
Part numbers
Load capacities for calculating service life
Maximum permissible loads

Size -Version	Part number	Load capacities C_y (N)	C_{y0} (N)	C_z (N)	C_{zo} (N)	Maximum permissible loads $F_{y\,max}$ (N)	$F_{z\,max}$ (N)
20	R1900 119 00	1150	800	330	190	350	100
25	R1900 125 00	1280	890	340	200	350	100
32	R1900 132 00	3670	2280	1080	550	550	180
52	R1900 152 00	8580	5100	2510	1230	2500	700
52-h	R1900 152 10	13950	7700	4190	1910	2600	800
52-sh	R1900 152 20	15500	9100	4600	2190	5300	1600

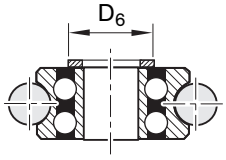
Dimensions



Size 20, 25, 32



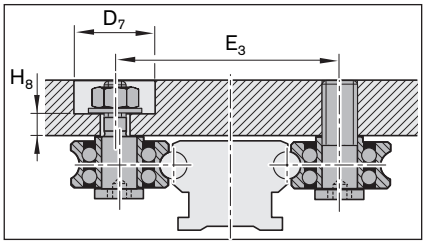
Size 52, 52-h, 52-sh



Size -Version	Dimensions (mm) D_1 g6	D_2	D_3	D_4 g6	D_5	D_6	H_1	H_2	H_3	H_4	H_5	H_6	H_7	SW_1	SW_2	SW_3	e	S_1
20	10	16	22,0	4	M4	9,0	7,0	8,5	4,6	16,0	19,5	3,2	0,8	7	2	2	0,45	4
25	10	17	27,0	4	M4	9,0	7,0	8,5	5,5	17,4	21,4	3,2	0,8	7	2	2	0,45	6
32	14	24	34,0	6	M6	11,8	11,0	12,5	7,0	25,5	29,0	5,2	1,6	10	3	4	0,90	6
52	20	35	51,3	10	M10	19,0	15,9	17,9	11,0	36,5	41,5	8,4	2,0	16	4	6	0,90	10
52-h	20	42	58,0	10	M10	19,0	19,0	21,0	11,0	44,3	50,3	8,4	2,0	16	4	6	0,90	10
52-sh	25	47	63,3	12	M12x1	24,0	19,0	21,0	13,0	44,3	50,3	10,8	2,5	18	6	8	0,90	10

Recommended hole spacing when using the following Cam Roller Guide Rails:

- Standard R1921
- With T-slot R1922
- Low-profile R1924-

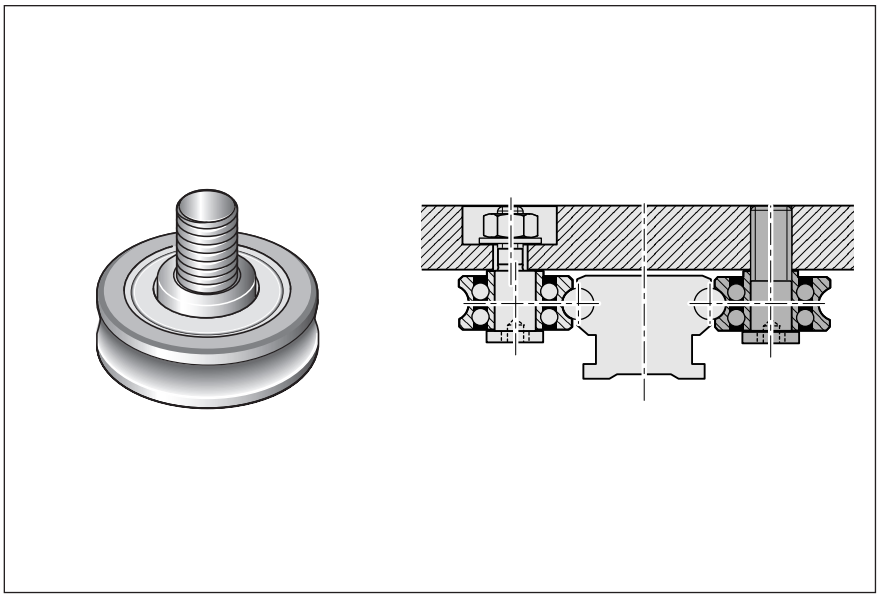


Size -Version	E_3 ± 0,2	D_7	H_8
20	33,8	15	3,0
25	39,8	15	3,6
32	54,0	18	5,5
52	83,3	30	7,3
52-h	90,0	30	11,8
52-sh	95,0	34	9,3

Cam Rollers with Spigots, Assembly Kits

Cam Roller with central spigot R1900 0

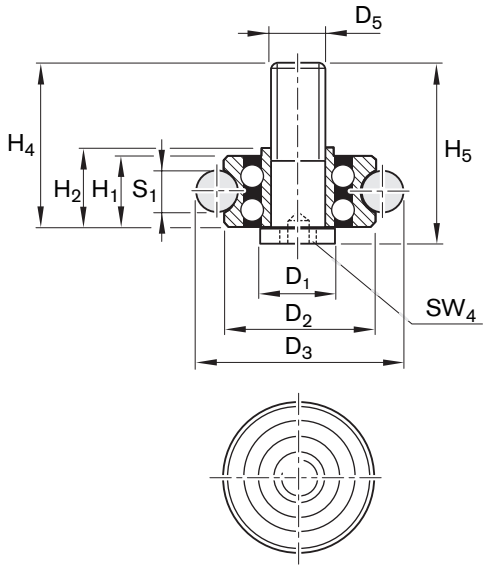
For mounting customer-built carriages, with central and eccentric spigots for zero-clearance adjustment to the guide rail.
For applications where even the versatile standard range does not offer the optimum solution to your problem.



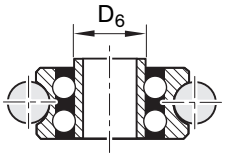
Part numbers
Load capacities for calculating service life
Maximum permissible loads

		Load capacities				Maximum permissible load	
Size -Version	Part number	C_y (N)	C_{y0} (N)	C_z (N)	C_{zo} (N)	$F_{y\,max}$ (N)	$F_{z\,max}$ (N)
20	R1900 119 01	1150	800	330	190	350	100
25	R1900 125 01	1280	890	340	200	350	100
32	R1900 132 01	3670	2280	1080	550	550	180
52	R1900 152 01	8580	5100	2510	1230	2500	700
52-h	R1900 152 11	13950	7700	4190	1910	2600	800
52-sh	R1900 152 21	15500	9100	4600	2190	5300	1600

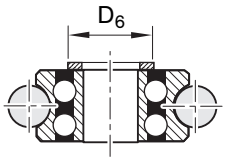
Dimensions



Size 20, 25, 32



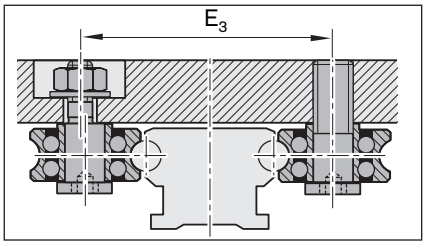
Size 52, 52-h, 52-sh



Size -Version	Dimensions (mm) D_1 g6	D_2	D_3	D_5	D_6	H_1	H_2	H_4	H_5	SW_4	S_1
20	10	16	22,0	M5	9,0	7,0	8,5	16,0	19,5	4	4
25	10	17	27,0	M5	9,0	7,0	8,5	17,4	21,4	4	6
32	14	24	34,0	M8	11,8	11,0	12,5	25,5	29,0	5	6
52	20	35	51,3	M10	19,0	15,9	17,9	36,5	41,5	8	10
52-h	20	42	58,0	M12	19,0	19,0	21,0	44,3	50,3	8	10
52-sh	25	47	63,3	M12	24,0	19,0	21,0	44,3	50,3	10	10

Recommended hole spacing when using the following Cam Roller Guide Rails:

- Standard R1921
- With T-slot R1922
- Low-profile R1924-



Size-Version	E_3 ± 0,2
20	33,8
25	39,8
32	54,0
52	83,3
52-h	90,0
52-sh	95,0

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